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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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By Ewing Galloway, N.Y.

SAN JUAN RIVER, NICARAGUA

A barge being towed by motor boat on the San Juan River, which would be part of the proposed Nicaragua Canal. The stream would have to be dredged most of the distance.

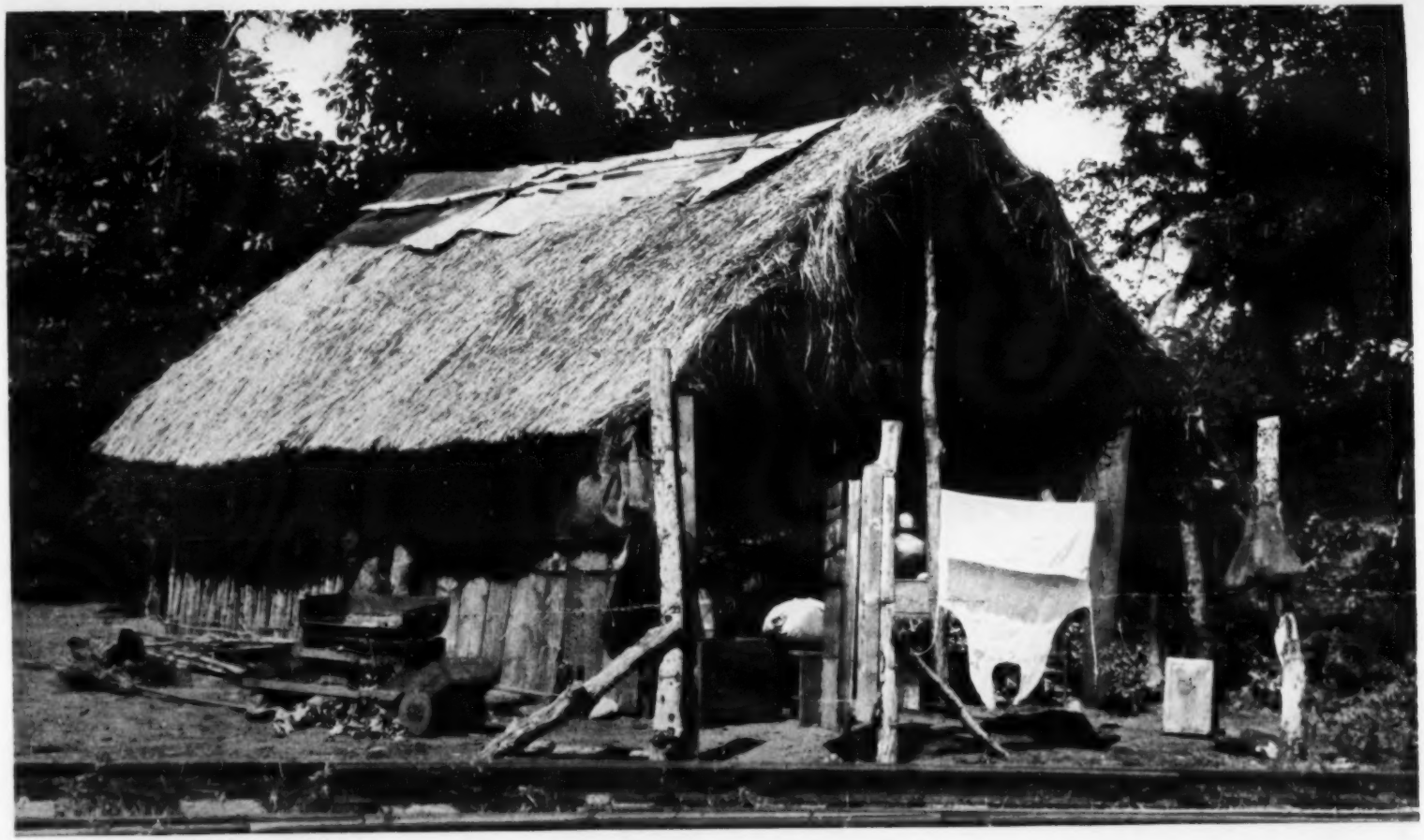
UNIV. OF MICH.

By Ewing Galloway, N.Y.

AN HACIENDA, NICARAGUA

A view on the edge of Lake Nicaragua near San Miguelito in the Department of Chontales. This section is developing into a cattle country. From this point the railroad will be built to the Atlantic coast.

the railroad will be built to the Atlantic coast.



Jas. Sanders—From Ewing Galloway, N.Y.

A NATIVE HUT IN NICARAGUA

This hut, photographed near Corinto, is typical of the rural districts.

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Jas. Sanders—From Ewing Galloway, N.Y.

MAIN STREET, GRANADA
This is one of the important cities of this Central American country.

This is one of the important cities of this Central American country.

Jas. Sanders—From Ewing Galloway, N.Y.

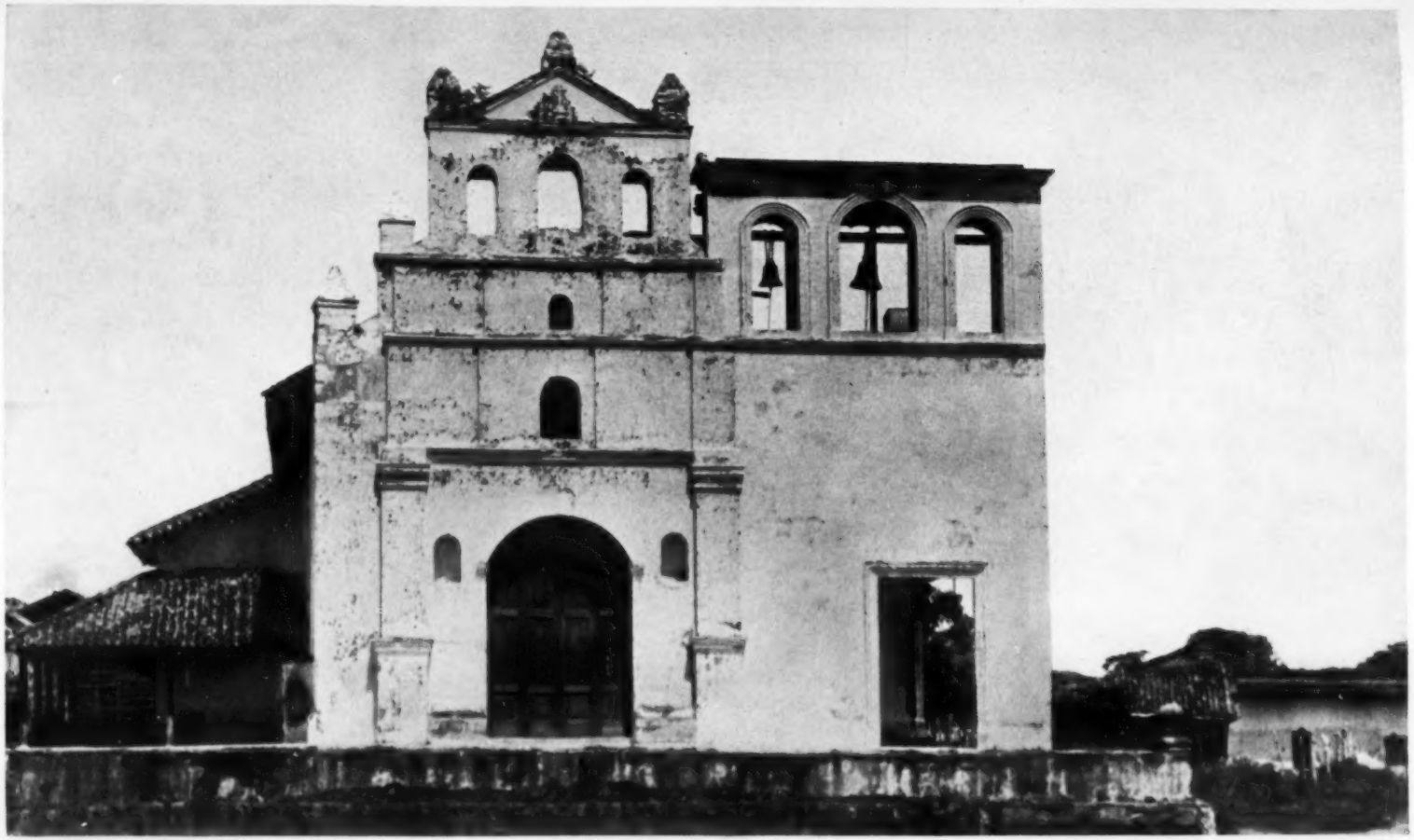
NEW MARKET HOUSE, GRANADA

This is the only fine market house in the country, those in other towns being ramshackle structures covered with sheet iron.

Jas. Sanders—From Ewing Galloway, N.Y.

THE CITY HALL, MANAGUA, THE CAPITAL OF NICARAGUA
This building, recently completed, is the finest in the capital.

This building, recently completed, is the finest in the capital.



Jas. Sanders—From Ewing Galloway, N.Y.

CHURCH IN GUADALOUPE, GRANADA

Where William Walker, the American filibuster, made his last stand before being driven out of Granada. From 1854 to 1856, Walker held the city of Granada; then he took the capital and dominated the country. Before being driven out, he made a last desperate defense in this church of Guadaloupe, located near the docks on Lake Nicaragua. As he retired, he burned the city, including this church, but the original façade is still standing.

Courtesy Lieutenant Commander R. S. Field, U. S. Navy

THE BRITISH CONSULATE, MANAGUA

Courtesy of Berwind-White Coal Mining Co.

From a Painting by Charles Robert Patterson
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BON HOMME RICHARD AND SERAPIS

Fought off Flamborough Head, England, September 23, 1779. Picture shows the battle just at the time of the explosion on the deck of the *Serapis*. At the extreme right is shown the American frigate *Alliance*, which shortly afterward opened fire on the *Bon Homme Richard*, killing a number of men. The three lanterns along the side of the *Bon Homme Richard* were a prearranged signal given by Paul Jones to the other ships of his fleet, in order to distinguish it from an enemy vessel. Force of explosion on the *Serapis* blew the British flag back against the wind.

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First Honorable Mention, 1930

Will *to* Win

By LIEUTENANT (J.G.) ERNEST MCNEILL ELLER, *U. S. Navy*

And all my life I must be striving, striving, until I am laid in the grave.
—PAUL JONES in Churchill's *Richard Carvel*

THIS is not history; it is a story of the wills of three men—a story of our Navy. Although an amount of history will enter into the story, the telling of it is not our purpose. Rather, it is our aim to take fragments of the chronicle of our young but brilliant Navy; to piece them together without attempting to choose more than a few of the many that form the mosaic of its existence; and to show, when the pattern is done, that a single greatness runs through all—the will of a man to win.

I

In the year 1779, under a late September moon, a rotten and worn-out merchantman tacked to a westerly course and opened fire. There were other ships present; indeed, she was firing upon one of them which was among the finest frigates in His Majesty's Navy, but it is this converted India trader that draws our eyes with the dramatic intensity of destiny, for she is being driven on by the relentless will of a single man—of John Paul Jones. There has been no other officer in our Navy or in any other navy who has shown more clearly and more persistently than this man the triumph of will. Without luck, without favoritism, politically hindered in promotion at home and tricked out of a squadron in France, without means—without anything but an unswerving, unyielding purpose, this man who *made* destiny was approaching the greatest test of his will, the greatest proof of its invulnerability.

Neglecting that will, the first broadside defeated him. The poor rotten old *Bon Homme Richard* was nearly blown from the water by the explosion of two of the three 18-pounder guns on the starboard lower deck. They were old cannon, anyhow, that Paul Jones had been able to haggle out of the French because they were condemned—and he had been glad to get even them. Condemned cannon in a condemned ship with a condemned crew! Has ever a more insane captain put to sea? The French commissioner must have laughed when the *Bon Homme Richard* stood out of harbor: in that ship Paul Jones would be coming back with loud excuses before the week was up. Or, if he did not, his eagerness was only a bluff, he would never dare to place that wreck under the guns of a British warship; the squadron, whose captains were free by their orders to disobey Jones, would not be hampered in its lucrative merchant-shipping chase by this strange and foolish crave to give battle to the English.

That commissioner would have laughed with amazed scorn to have witnessed the *Bon Homme Richard* laying in close alongside the *Serapis*. He would have shrugged his shoulders in pitying contempt could he

have seen the old merchantman after the explosion. The lower deck was a slaughter house. Nearly all the crews of these two guns were killed or wounded. A huge hole was rent in the ship's side. Above, through a jagged wound in the upper deck, the sky could be seen. The remaining men went topside and Paul Jones was left with a sloop-armed vessel having a broadside of seven 12-pounders and eleven 9's, throwing a total of 183 pounds of metal a salvo, against ten 18's, ten 9's, and five 6's, making a total broadside weight of 300 pounds for the *Serapis*.[1] But Paul Jones still stood on deck! Aye, Paul Jones still led and that indomitable will still nerved his soul. What mattered, then, this calamity? He would be in a far worse position many times before this fight would be over . . . . and never once would that will be broken, never once swerved from its course.

There is something awe inspiring in the will of this man, something that defies explanation by the mere terms courage and faith, something that causes us to look at his life and to know again that anything is possible to the will of a man.

He was going to win. He had set his will to that and had forgotten everything else in the world. It was as if he had set that one idea before him on the quarter-deck, had locked his mind to all other ideas, had thrown the key away, and had then marvelously turned his whole mind and body toward the achievement of that idea.

It was sheer will, nothing else. Time after time he was beaten. In an hour, according to Jones's own account, the *Bon Homme Richard* "had received sundry eighteen pound Shot below the water, and Leaked very much. My battery of 12 pounders, on which I had placed my chief dependency . . . . were silenced and abandoned."[2] Only a few 9-pounders left to combat the might of the *Serapis!*

He was beaten; and yet in that man's mind there was still but one idea, still but a single purpose: he was going to win! A chance came. He was able to run his unwieldy and shell-stricken ship aboard the *Serapis*. And now there was no doubt: at a distance the *Serapis* might have sunk him; now, if the *Richard* sank, he would board the *Serapis*—or the two would sink as one, as an English writer makes Jones say while with his own hands this unbeatable man lashes the two ships together: "If my ship sinks . . . . she shall not sink alone."[3]

But the ships were lashed so that the *Serapis* swung, and now her fresh starboard battery was brought to bear, making the situation of the *Richard* indeed desperate. Only two 9-pounders of her whole engaged battery remained in action, and even these were deserted when the officer in charge fell wounded. But Jones was everywhere, and where he was the battle was. He took his post at these two guns, rallied a few men about him, and with this remnant of a ship opened fire again.

Such steadfastness of will! It was magnificent—more than magnificent, it was awesome. It must have been this moment that inspired the following vivid passage in *Richard Carvel:* "To us hearkening for his answer his voice betrayed no sign of dismay. Seven times, I say, was that battle lost, and seven times regained again. What was it kept the crews at their quarters and the officers at their posts through that hell of flame and shot, when a madman could scarce have hoped for victory? What but the knowledge that somewhere in the swirl above us was still this unswerving and indomitable man who swept all obstacles from before him, and into whose mind the thought of defeat could not enter. His spirit held us to our task, for flesh and blood might not have endured alone."[4]

It must have been then that Richard Pearson, captain of the *Serapis*, felt gathering about him the inevitable purpose of this man whose will had already pervaded the *Bon Homme Richard*. "Long before the close of the action," Pearson says, "it became clearly apparent that the American ship was dominated by a commanding will of the most unalterable resolution, and there could be no doubt that the intention of her commander was, if he could not conquer, to sink alongside."[5]

With the two 9's and another that was moved from the opposite side, with muskets and hand grenades and combustibles—with every fragment of means and hope, Paul Jones fought and inspired his men to

[1] Frost, *We Build a Navy*, 79.
[2] *John Paul Jones Commemoration*, 146.
[3] Wemyss, *A Noted Woman and Other Sketches*, 228.
[4] Winston Churchill, *Richard Carvel*, 483.
[5] *We Build a Navy*, 85.

fight on. Where he was the battle was. "I myself was in the maintop . . . ." states one of his officers, "fifty or sixty feet above the quarter-deck, but I could hear distinctly, amid the crashing of the musketry, the great voice of the commodore cheering the French marines in their own tongue . . . . exhorting them to take good aim, pointing out objects for their fire, and frequently giving them direct example by taking their loaded muskets from their hands into his and firing himself. In fact, toward the very last, he had about him a group of half a dozen marines who did nothing but load their firelocks and hand them to the commodore, who fired from his own shoulder, standing there on the quarter-deck rail by the maintopmast backstay."[6]

It was a will, Jones's will, against the fire of the *Serapis*. Her shots tore away the sides of the *Richard*. Water rose in the old ship's hold. Two ordinary men could endure no longer the awful carnage. The master-at-arms with another ran to strike the colors, but found them gone, fortunately shot away, Jones writes, so the two cried for quarter.

Captain Pearson heard the cry. In amazing words he tells of it: "Hearing or thinking that I heard a call for quarter from the enemy, I hailed to ask if he had struck his colors. I did not myself clearly hear the reply, but one of my midshipmen, Mr. Hood, did hear it and soon reported it to me. It was to the effect that he was just beginning to fight. This I at first thought to be mere bravado on his part. But I soon perceived it was the defiance of a man desperate enough, if he could not conquer, to sink with his ship alongside."[7]

As he made his famous reply, Jones downed one of the two cowards with a pistol; the other he drove back to his position. And now, surely, his mighty will has been tried enough, surely no more can be expected of it. But no! The battle rages on without let-up. For the second and third times the *Alliance* pours broadsides into the *Richard*. Water rises in the holds. Suddenly the sternest test of all comes when the master-at-arms, again losing control of himself, frees the hundreds of prisoners and they swarm up on deck from below in overwhelming numbers. Even Jones must have been appalled by this last disaster, for he writes in his official report: "Some officers persuaded me to strike, of Whose courage and good sense I entertain a high opinion. My treacherous master-at-arms let Loose all my prisoners without my Knowledge, and my prospects became gloomy indeed."[8] At last *he* saw gloom; what could even his great will do now?

Churchill again gives a dramatic picture, as Richard Carvel speaks, of how the will of the man rose to supreme heights: "Those of us who had clung to hope lost it then. . . . . The seventh and last time, and we were beaten, for we had not men enough left on our two decks to force them down again. . . . . At a turn of the hand I should have sunk to the boards had not a voice risen strong and clear above that turmoil, compelling every man to halt trembling in his steps.

" 'Cast off, cast off! The *Serapis* is sinking. To the pumps, ye fools, if you would save your lives!' "[9]

They went back, except one who escaped to tell Pearson of the desperate condition of the *Richard*. The battle renewed for a time. But it is enough. Flesh and blood cannot endure against a will like this. It is enough; the man won. In a high, golden moon the British ensign fluttered to deck as from the sinking *Richard* boarders clambered over the side of the *Serapis*.

"I would not, however, give up the point . . . ." continues Jones in the report cited above, "and the British colours Were Struck at half an hour past 10 o'clock."[10]

A will had conquered a ship.

A generation passes. It is another September, thirty-four years later. The sun is approaching the meridian; before it sinks to the horizon the will of a man will have conquered again.

For six months Perry had been planning for this battle. Every minute of that time he had been working ceaselessly, completing the building of the vessels and the excellent organization Chauncey prepared for him. He had been given much, but leaping every obstacle, never hesitating, driving on under his restless will, he had accomplished far more than could have been expected of him.

[6] *We Build a Navy*, 87-88.
[7] *Ibid.*, 88.
[8] *John Paul Jones Commemoration*, 147; official report of engagement.
[9] *Richard Carvel*, 483.
[10] *John Paul Jones Commemoration*, 147; official report of engagement.

He had accumulated stores and arms and men; he had completed the ships necessary to give control of the lake; and with men, at last, to man the ships, by his own unconquerable will he had dragged them in the very face of the enemy over the harbor bar into the lake—Lake Erie, where would soon be fought one of the decisive battles of our history.

His, too, was a tireless will that drove him beyond the limits of believable endurance; and then drove him on again. Cautioned, restrained, insulted by his superior in command, weakened by months of fever, he had nevertheless got a fleet ready. For a flame was driving him on, the flame that must burn in the hearts of all great commanders: the will to meet and to defeat the enemy. It is a flame that cannot endure delay, but will not allow careless preparation; it is a will for battle and victory that glories in a chance for an engagement, but enters into it coolly with well-set plans and every resource ready.

Men to man his ships had been Perry's greatest problem. Burning for a fight, he wrote to Chauncey, his superior officer, early in the summer: "Think of my situation, the enemy in sight, the vessels under my command more than sufficient and ready to make sail, and yet obliged to bite my fingers in vexation for want of men."[11] By begging, by recruiting in the countryside, by any means possible, he had at last accumulated half the number of men Chauncey and he had agreed to be necessary. He wrote Chauncey that he would engage the enemy with such forces as he had. The reply was an admonition and a letter placing the entire responsibility for any action upon Perry himself.

Perry's was a lesser will than Jones's. John Paul Jones lived with but a single goal in his heart: to get at the enemy and to defeat him. That was the eternal cry of his great will, and to accomplish it he endured all things, even to insult and injustice. Nothing within himself or without could swerve him from this, his one great purpose.

Perry's will was a little less great. Chauncey's deep injustice to him in the midst of the strain of fever and unceasing toil and persistent requests of the army for action sheered him off from his purpose, caused him to send in a request that he be relieved of command. Is the will that had endured so much at last broken? Will the fighter give up for any reason, even an injustice, a chance to serve his country, a chance to give battle to the enemy? Injustice is bitter and rankles far worse than injury . . . . a man must be driven by a will almost god-like to hold to his purpose through it. Jones did to the end of the Revolution; Perry did, when he had cooled. It may be that he had not meant to resign; perhaps that was only a means he used to battle injustice—and to battle it is not a weakening of will; certainly he was glad the Secretary did not accept his request—and probably salved a bit, too, in pride; at all events, it was but a slight flaw in a will that was of the same deep fiber as that of Jones.

He was saved for his one great work. And so it was that thirty-four years after the victory of Paul Jones two long columns of ships came together under a meridian sun, and the same resistless will that had shone in the years before was a star leading our Navy again to glory.

Perry, through his energy, had built up a superior force; but as the sun dipped in the western sky he found himself fighting against odds. Part of his squadron had been left to the rear by his anxiety to engage; the *Lawrence,* his flagship, was suffering under the fire of the more numerous long guns of the British. He closed to carronade range. But his advantage there, too, was quickly overcome when the adversary of the *Niagara,* Perry's other large ship, dropped down to bring her guns to bear on the *Lawrence.* The *Niagara* did not come to Perry's aid; so for two awful hours the *Lawrence* was battered to ruin. Most of the crew were shot down—out of 103 fit for duty, 83 were killed or wounded in the fight; most of the guns were silenced, but still Perry held grimly on. The ship and her rigging were shot to pieces, but still over her floated a large blue flag waving the defiance of these immortal words of another will unconquerable even in death: "DON'T GIVE UP THE SHIP."

Still Perry fought on. A lesser will might long ago have quit, for it seemed apparent the *Niagara* was not coming into the action. Still he fought, hopelessly outclassed, with his ship shattered, his crew wounded and dead, the victory flying swiftly to the enemy. Unless the *Niagara* came quickly the battle was lost. But the fight

[11] *We Build a Navy,* 388.

went on and she did not come. Then this man, who, too, *made* destiny, fired a last gun with his own hands, put the blue flag over his arm, and left his ship.

Was he himself disobeying the words of that roughly made flag; was he giving up his ship? Was he? . . . . No! As he stepped into the little cutter carrying the blue flag of battle on his arm, he was executing one of the most daring and momentous decisions of our naval history. He was leaving the beaten *Lawrence* that he might cross to the unharmed *Niagara* and bring her into battle. It did not matter to him that the crossing was in an open boat, that musket balls filled the air, that the splash of cannon shot tore up the water about him. For a will that would never acknowledge defeat was driving him on, was striving to win as it had striven magnificently through the months. Death in the open boat, or victory —these were the two alternatives, and the only two that this unbreakable will allowed.

So, where another might have struck his flag for lack of a will that would not quit when it was beaten, Perry dared to victory. He won to the *Niagara* unhurt, of course—who does not win who dares! And the battle was finished, for this fresh strength could not be withstood. In a few minutes the victory was his and on the back of an old letter this jewel of history was inscribed to Harrison:

U. S. Brig Niagara, off the Western Sisters,
Head of Lake Erie Sept. 10, 1813—4 P.M.

DEAR GENL: We have met the enemy, and they are ours—two ships, two brigs, one schooner and one sloop.

Yours with greatest respect and esteem.
O. H. PERRY[a]

But on the history of man a message was written in finer and bolder strokes: the will of a man had won again. . . . .

A will had conquered a fleet.

Evening, noon, morning—this is the order of our chronicle. Two generations had passed. Forty-nine years after Perry had won Lake Erie an old man was directing a desperate venture. In the still hour before dawn Farragut's fleet was attempting what was thought to be impossible; a will was doing what it was said could not be done; the forts of the Mississippi were being passed.

And as an invincible will is a strange and supreme thing well-nigh past understanding, so is its appearance stranger when suddenly it shows for the first time in a man who is drifting into the twilight of his years. It was Farragut's first chance. In over fifty years of service no other opportunity had come to him to prove the strength of which he was capable. So that if you look only at the battle itself, and his other great one, you are amazed at his sudden strength, at his resourcefulness, at his unexpected resolution of will; you are ready to say with the many cursory thinkers: "The man was a lucky genius made by fate for that one moment."

But if you look at the years of his life that preceded, you realize that Farragut's genius was not made by fate; he made it himself—he, too, *made* destiny. It is a common fallacy to regard an achievement of a great man as the result of a moment, of the sudden bursting forth of the powers which made the achievement possible. There is genius, no doubt—the possession of the will to win or the ability to develop it is a sort of genius —but ordinarily it no more leads suddenly to success than does a seed immediately leap into stalk and flower. Farragut's road to fame was a long, hard one, as is that of most men who arrive to it, as was that of Jones and Perry. That giant will of Jones would not have had a chance to show how invincible it was in battle had it not driven him on through years of opposition and disappointment in America and France, holding true to the one aim of some day defeating the English. Perry would never have won Lake Erie had he not striven against what to most men would have proven insurmountable obstacles in getting his fleet ready. Farragut would not have won to New Orleans had he not been preparing himself during half a century in the Navy. Thus are these wills similar; nevertheless, they are not the same. Out of the brotherhood of constancy of effort each shines with a different glory. Jones's will flamed supremest that September evening against the *Serapis* when it proved that with nothing but the flimsy fabric of a will a man can silence guns, crush an enemy, defeat a proud ship. Perry's will achieved most in the months his fleet was being built, showing how little are obstacles, how important a will, in successful preparation. Farragut's will burned with a steady luster against the hardest strain of all, dem-

[a] Paullin, *Battle of Lake Erie*, 43.

onstrating how through a lifetime of disappointments, of dry routine, of little daily tasks, a man can hold true to himself and to his aim.

There is no denying the strength of a man's will that through fifty aimless years without a definite goal will not let him slacken from his ceaseless efforts to be prepared. That was Farragut's aim: to be prepared. For what? He did not know; he only knew that he must be ready, must be equipped to lead when the call came for him, that he must strive, strive, strive, in order that he might give his best in answer to this call.

The waiting years of preparation were not easy for Farragut because his was not a plodding nature. He loved battle and was anxious to prove his ability. When he was hardly twelve, serving as a midshipman on the *Essex*, he commanded a prize, quelled a mutiny, and brought his ship safely to port. A few months later he wrote regretfully of a lost opportunity to engage H.M.S. *Phoebe*, and many days afterward, as the *Essex* was being shot to pieces by the *Phoebe* and *Cherub*, he set down a bit of his own nature in his journal, ". . . . it was perceptible . . . . that our case was hopeless. It was equally apparent that all were ready to die at their guns rather than surrender."[13]

Thus eventfully began a career that was soon to be smothered in years of dull routine. Twenty, thirty, nearly forty years went by and no chance came to Farragut to distinguish himself. He could not have been blamed had he stagnated and lost hope. But his will would not let him do that; it would not let him cease in his endless efforts to prepare himself. The preparation might be wasted, a chance might never come; but he must be ready. That was the command of his soul. . . . . Something of its restless urge lives in these fateful words from a letter of Farragut's to the Navy Department:

> I . . . . had taken great pains to inform myself as to the local advantages in attacking the place, measured the depth of the water all around the fort, and marked the penetration of every shell from the French ships . . . . in so doing I had not at the time looked forward to a war with Mexico, but *I had made it a rule all my life to note these things with a view to the possible future.*[14]

[13] Loyall Farragut, *Life and Letters of Admiral D. G. Farragut*, 35.

[14] Clark, Stevens, Alden, Krafft, *A Short History of the U. S. Navy*, 223.

Aye, in that last line the will speaks! The will to win that is not a sudden flash for use in battle alone. The peace days, the dull days, are hard days, but in them a man forms himself. He who will not rest through them will be ready when the opportunity of his life comes to him.

When Farragut wrote that letter the Mexican War was on. Plans were being made for the capture of Vera Cruz and he was submitting one of his own. Twenty years earlier he had thoughtfully watched the French take the city and he knew how it could be done. How his heart must have leaped: his chance had come at last! Yes, it had come; but instead of its being given to him he was put in command of a blockading ship off Tuxpan where, of course, nothing ever happened. There he was, shelved for the war, shelved probably for life, for he was getting old. What incentive was left to him? There was none. But there was his will. Through the months it sustained him off Tuxpan; into the border of old age it sustained him through the years of inactivity that followed.

This is not an attempt at a story of Farragut's life. It is but to give a glimpse of him and the will that guided his star, to show why the events that followed at the passes of the Mississippi were not chance or luck but the strange will of the man culminating in the only end it could see: preparation, grasping of opportunity, battle, and victory.

Farragut was in his sixty-first year when he took command of the project against New Orleans. He was reaching the age when daring men become cautious and brave ones slow to action. But not age, nor the desperate character of the venture, nor restraining advice could hamper the will that through life had driven him on. Carefully Farragut prepared his fleet; haste now, when he had waited so long, would be foolish. Carefully he listened as men recounted the insurmountable dangers, as they pleaded that the forts be reduced or stormed before the fleet tried to pass, as they made prophecy of certain destruction. Carefully he listened, but he had not been preparing and learning for naught all his life, and on the morning of April 24, 1862, he took the fleet past the forts.

It was in the dark hours of the midwatch when men's hopes are lowest and sentinels

are sleepiest that the fleet got under way and in a long dark column slipped up the Mississippi. Farragut stood anxiously on deck watching the first division of light craft proceeding up stream. The die was thrown. He had done everything he could to get the fleet ready. He had not waited after it was ready. He was setting out now with a single purpose—to win past the forts.

As the first division reached the breach that had been previously made in the barrier of logs, chains, and ships across the river, they were discovered. Instantly the guns of the forts began firing, turning the banks into thunderous crashes of flame. And midstream the dark water reflected other flashes as the ships took up the challenge. Harder and fiercer raged this weird battle as the heavier vessels came into range and out of the darkness the Confederate ships charged down to join the melee. Just as the midwatch ended the crisis came. A strange and spectacular craft bore down on Farragut's flagship, the *Hartford*. A blazing fire raft was being swept directly upon her. At that instant something of vast portent must have been felt over all that wild scene on the river. The decision of battle hung by a hair, for in turning to avoid the raft the *Hartford* had struck a shoal. Neither did she evade the raft, for too late the discovery was made that it was being directed by a tug. So, there, under the fire of the forts, aground, with the side exposed to the fire raft already bursting into flames, the fate of the *Hartford* was becoming desperate and with her the fate of the whole expedition. But the will of Farragut rode high above misfortune. His ship could not sink, nor burn, nor quit broken on a shoal, because he willed that none of these could be. Working furiously in leaping shadows the crew of the flagship drove the tug off into the night, the raft was pushed clear, the flames were extinguished, the *Hartford* was freed. The crisis was past. The battle lasted much longer, but the issue was no more in doubt. A will that through life could not be stayed had steered straight to victory. In a torn and flaming darkness a will had found its fulfillment, for, with the forts passed, on the morrow New Orleans fell.

Two years later in Mobile Bay his will was to be given a sterner test. Sure disaster impended ahead where one of his squadron had just sunk, torpedoed; possible disaster lay behind. But again this man's will throbbed with a deep and mighty tenor as he grimly set his face and his heart ahead, as the will in him, seeing only its goal, cried sternly out:

"Damn the torpedoes! Four bells! Captain Drayton, go ahead! Jouett, full speed!"[15]

But the April morning that saw the fall of New Orleans marked the highest achievement of that will. The South's greatest port was captured; the shattering of the backbone of the Confederacy was begun; possible European intervention in the blockade was prevented; perhaps, even, the Union was saved by this blow—all because a man had seen his goal, had understood it, and would not be turned from his purpose.

After half a century of striving, a will had won once more.

A will had helped save a nation.

So we come to the end of our chronicle, a chronicle of the power of the will to win. We have portrayed the wills of three of our most famous heroes; and, because those things that are longest past are seen in truest perspective, we have chosen them purposely from our earlier history. These three are not all the mighty wills of even the period covered by this chronicle—thank God! There are many more, but these were selected because the will of each bears a vaster import to the history of our country than the mere winning of a battle.

Neither has this attempted to detail history, nor to prove systems of tactics and strategy, nor to show the value in peace or war of boldness of offense, vigor of attack, tenacity of effort, carefulness of preparation. Indeed, its one purpose, as we set forth in the beginning, has been to reveal in the lives of three heroes the greatest of all qualities in a leader: *the will to win.*

The make-up of great men is not the same, neither in abilities nor vices nor lack of vices. We cannot go to their lives and place a finger on a certain characteristic and say: "This is the thing. Here is the one thing that makes all these men great."

We cannot do that. Yet we could come very near to the truth if we should say: "They are brothers in achievement because they have the will to win in their souls." A

[15] *A Short History of the U. S. Navy*, 338.

rare, scattered few may succeed merely because of luck or training or environment. But in the lives of most there appears predominantly an overwhelming, undeviating will which, when set to a purpose, cannot be battered or lured or persuaded from its determined course. Hence we can almost say that a man *must* have that will; he must be born with it or he must develop it. No matter how he acquires it, he must have it to succeed greatly. And he must have all the parts that combine to make it such a force: concentration, drive, and faith.

A man's goal must fill his mind day and night. No other thing in life can become so important to him that it will cause him for one moment to set it aside. He must concentrate solely upon it. This does not imply that he will do nothing else, for life is made up of many parts and many needs; but it does mean that nothing shall ever become more important to him than his goal, that it and it alone will influence his every act, that in his mind he shall always be thinking, seeking, striving after it.

It must be the passion of his mind, whether it be an immediate goal or the great goal of his life. Yet this alone, this mere willingness and desire to think of it cannot carry him to it. Though it fill his mind, it will be but a dream floating through the years if he has not drive to press toward it. After he has seen the goal, drive is that quality in him that makes him press toward it with every energy in his body. It is the quality that makes him fight on when every hope is lost, when strength is gone, when ordinary flesh could endure no more. It is the force that rebounds from a momentary failure, for no failure this side of death need be permanent, to build out of it a new route to the goal. It is the force that never ceases, never slackens in its drive to win, that is not deterred from its purpose by anything under heaven. It is not a reckless drive, but a command to do. It demands that a man shall choose carefully and use every advantage, remembering that caution may rule one occasion, forwardness the next, but that in all moments of doubt he who is brave and attacks has not done wrong.

Above all, a man must believe in himself and in his goal. He must believe, must *know*, he will win. Whatever disaster or obstacle may come, the idea of winning must be the only eventuality he will accept. There can be no defeat for there is no thought of defeat. To win! to win! to win! not merely to say that and to seek it, but to believe it with all his soul—that is faith. And with faith he can do all things.

Such are the parts, the three great parts, that make up the *will to win*. If we look at the wills of the three men of our chronicle we see that each is made up of these same divisions: a strange, unlimited faith; an indomitable purpose; and the man's whole being a single force bent on accomplishing that purpose.

It is this will to win that in war and peace should be the spirit of all who serve in the Navy. Those who make her history of the future, like those others who builded so nobly in the past, must be driven by it. . . . Those who will have it must say to their hearts the words Churchill puts in the mouth of the man who never heard of defeat—Paul Jones:

"And all my life I must be striving, striving, until I am laid in the grave."

Personality Plus—*in* Warships

By Ensign W. A. Dyer, Jr., *U. S. Naval Reserve*

"THERE'S a beauty in the bellow of the blast; there's a grandeur in the growling of the gale." So runs a part of the historic operetta "Mikado," and to nothing does this quotation more strictly apply than to the modern man-o'-war. A 32,000-ton superdreadnought may be but a mass of guns and steel to many a layman, but to the Navy man who knows her and lives on her, she is a distinct personality; and few pictures in the Louvre, few pieces of sculpture from ancient Greece, will, in his mind, surpass her in beauty. Warships have definite characters, to the initiated, and it is the purpose of the writer to suggest impressions he has received from the outward appearances of typical modern ships of war.

First, to our own Navy. During the first years of the twentieth century, American naval design was characterized by extreme and almost naïve simplicity—in keeping perhaps, with our impression of what a navy should be—a line of defense built solely to our own needs, open to the public, and there for the world to see. No ships more clearly envisioned this spirit than did the *Texas* and the *New York* as they came into service in their original dress back in 1912—less powerful, perhaps, than today, but more pleasing to the eye. Here are dreadnaughts perfectly proportioned, beautiful in their simplicity, noble in the contour of their lines. No tricks or subtleties of design are in evidence—no broken decks, no turrets on the side or in echelon, no staggered stacks or masts.

The big dreadnoughts in our fleet today are of a different type—more expressive of post-war America. The sisters of the *Colorado* and *California* classes, as electric as radio receiving sets, exemplify to an extreme American specialization. Their stacks so mysteriously small, their derricks so much in evidence, their compact basket masts, their pointed clipper bows—and especially the complication of conning towers and bridges that house the brains of these ships—all carry out the idea of electric efficiency. Better get tangled in the highest of high-tension wires than come in contact with the U.S.S. *Colorado*.

Recent British capital ships have reflected two distinctly English traits—bold sportsmanship and the proverbial bulldog tenacity. The first is apparent in the battle cruisers that fought at Jutland and in the emergency war-program battle cruisers that followed them—excepting the *Hood*. These are ships which look far from formidable, not being heavily gunned for their size and possessing so little freeboard. But they have a brave, "cap-on-the-side-of-the-head" look about them, as if they were ready to rush into battle at all times, though the enemy be twice their size.

The *Royal Sovereigns* and *Queen Elizabeths* are the expressions of the other extreme—bulldog tenacity—solid, invulnerable in appearance—looking far more compact than our *Colorados*, though the lengths are approximately the same—looking far more heavily armored, though indeed they are less so. The stiff prows, the inbuilt appearance of the secondary batteries, the turrets backed up to the solid superstructure amidships, and, in the *Queen Elizabeths*, the trunking of the fore funnel—all conspire to give this impression. *Resolution*, one of the *Royal Sovereigns* is named—and rightly so.

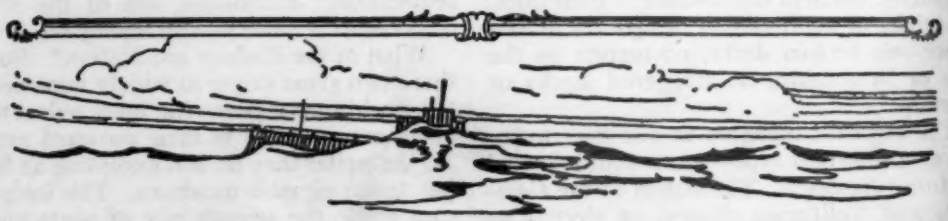
What of the *Rodney* and *Nelson?* Surely these two great ships, so widely regarded as the world's most powerful, must reflect their enormous strength in their outward aspect. To the writer they do not, excepting as floating forts, gigantic monitors. The insignificant stack, the smooth row of ports on the side give little evidence of the deep main armored belt and the bomb-proof protected decks; and the general awkward appearance gives still less indication of the 45,000-horsepower plus and the twenty-three knots.

In passing, perhaps no vessels in the British Navy possess more distinct or more pleasing personalities than the small "C," "D," and "E" cruisers. Sleek, graceful, spirited, with their 6-inch superimposed turrets fore and aft, and their stacks and masts at a rakish slant, these vessels are the personification of pluckish contempt.

Japanese men-o'-war have in the past exhibited less pronounced individualities than vessels of other great powers, due in great part to their being inspired by British design. In late years the order has changed. The mighty *Mutsu*, longest of all dreadnoughts, is unquestionably Japanese, with her curved fore stack, snub bow, and colossal heptapodal foremast with its maze of tops and bridges. But as orientally different as a rickshaw itself are the cruisers *Kako* and *Furutaka*, with fiendishly slanting decks, truncated funnels almost leaning back on themselves, trawler bows curved forward, conning towers not unlike lighthouses, and single 8-inch gun turrets on the center line so numerous that they resemble flights of steps. And equally Far Eastern are the new *Kinugasas* and the remarkable little *Yubari*.

French naval construction, which came to a standstill during the World War, is again on the increase, and the new vessels from the boards of France's naval architects reflect the spirit of this rapidly recuperating nation. There is a dash to the *Duquesne* and the *Duguay-Trouin* classes indescribably French, and the new destroyers and destroyer leaders, with their slanting sterns, clipper bows, and rakish stacks, are the personification of speed, as contrasted with strength.

Finally no discussion of warship personality would be complete without mention of the German Imperial Navy of 1917. Few men-o'-war of modern times have been as romantic in appearance—as "distinctively different." A lighter grey paint, a generally lower freeboard, and tall, thin masts did much to produce this impression. Smaller than contemporary vessels in other navies, the German dreadnoughts, but more especially the high-seas battle cruisers, gave the impression that they were the work of super-designers—experts who knew what they were doing—and how to do it. The German destroyers, with their deep forecastles, carried out this impression, an impression which reached its climax, however, in the German submarine. Compared to the German U-boat of 1916, American "S" boats and British "L" boats look frail and unconvincing indeed. With its big rounded deck, its snugly rigged wireless equipment, and its twin guns next to the low conning tower trained fore and aft, the German U-boat looked able, seagoing, and efficient—in every sense of the term. And the new 6,000-ton cruisers of the German Republic, with their unique foremasts, absence of mainmasts, broken decks, and novel bridge and conning tower placement, reflect the impression of precision and efficiency so typical of pre-war German naval construction.



Diplomatic Aspects *of the* Nicaragua Canal

By CAPTAIN GEORGE J. B. FISHER, *U. S. Army*

IT IS only too evident that in the not distant future the United States will undertake the construction of an isthmian canal via the Nicaragua route. An examination of the international commitments which involve this project is therefore not untimely.

In building a second canal, the best interests of the United States seek a waterway which shall be a strictly national utility. Apparently the path in this direction is unobstructed.

As to suzerainty, the willingness of Nicaragua to have the United States build the canal on its own terms is evident. The problems of approach defenses have quietly solved themselves. The physical task presents no great engineering obstacles. Nor will appropriations be lacking when the proposition is properly presented to the country. There remains only to take up our existing option with Nicaragua and enter into an appropriate bilateral treaty respecting the rights of each nation in the premises, in order to initiate an all-American canal joining the Atlantic and the Pacific.

Such an arrangement, however, would make possible the exemption from tolls of ships of American registry.

Notwithstanding the fact that the Nicaragua route will be used almost exclusively by intercoastal traffic, the possibilities of isthmian tolls exemption for the shipping of any one nation are so far-reaching as to involve certain opposition from abroad.

With interoceanic transit available minus the payment of the present charge of $1.20 per net ton, the United States merchant marine must receive a tremendous impetus. This virtual subsidy would, in fact, place American shipping in a commanding position as a carrier of world trade.

Inevitably British maritime interests stand to suffer under such a handicap. It is therefore logical to anticipate a concentration of all the strength of the British Foreign Office in diplomatic resistance to an unneutralized Nicaragua canal.

The legal arguments to support this resistance, while they may lack the strength of those advanced during the Panama tolls controversy, are still not without some historical precedent. For Great Britain has a stake in Central America, a heritage from the past which doubtless will be utilized in connection with any diplomatic discussions of the Nicaragua canal.

The extent to which this will influence the policy of the United States, however, must depend largely on the vigor of the Washington presentments.

In order to apprehend the nature of British influence in isthmian canal affairs, it is necessary to consider conditions precedent to the much criticized Clayton-Bulwer treaty of 1850.

At that time the canal project had already been actively discussed for a quarter of a century. These discussions were brought to an issue, however, in 1849. The vast territorial acquisitions which followed the war with Mexico gave to the United States a Pacific coast line accessible only by overland trails and via the long passage around Cape Horn. The need for a short water route had become accordingly urgent.

But, although Clay as Secretary of State had announced in 1835 that an isthmian canal should be available to all nations on equal terms, which policy was later underscored by Congress, the immediate project was clouded by the threat of British dominance of the proposed waterway.

British interest in the Caribbean began in the days when the Spanish Main was an area of importance in world affairs. Great Britain early assumed control of numerous

islands in the West Indies, and had repeated clashes with Spain over claims on the Central American mainland.

Latterly in the eighteenth century British subjects engaged in lumbering operations along the stretch of coast inhabited by the Mosquito Indians from Cape Gracias à Dios south to Costa Rica. These operations led subsequently to the establishment of a British protectorate over the Mosquito country, administered from Jamaica. Despite the opposition of both Nicaragua and the United States, Great Britain extended this control southward until she dominated the mouth of the San Juan River, at the same time attempting to occupy a strategical location on the Pacific coast of Nicaragua.

Such an example of European opportunism in the Western Hemisphere would be impossible under later-day conditions. Yet, as a *fait accompli* it was a factor to be reckoned with in contemporary discussions of the Nicaragua canal; and it presented a grave problem to the Washington government, which was extremely anxious that the canal be built as an aid to both internal and external development.

To offset this territorial foothold, the United States had negotiated "favored nation" treaties with Nicaragua and Honduras providing suitable diplomatic background for the construction of a canal. But ratification of these treaties was withheld until an assurance of the amiable intentions of Great Britain could be had.

The idea of constructing the canal as a governmental enterprise was not at the time entertained.

Yet it was apparent that the Central American nation whose territory any canal must penetrate had neither the wealth to build the canal nor the political stability to maintain it. Under these circumstances it seemed necessary that a group of capitalists negotiate a concession for building the canal and that the arrangement be sponsored by one or more of the great powers.

The capital necessary for this project was not, at the time, to be had in the United States. London was the world's financial center, to which all eyes instinctively turned when projects of such magnitude were being considered. Great Britain held the purse strings and Great Britain occupied a commanding position with respect to the most feasible route for the canal. All the United States had to contribute to the situation was an urgent need for isthmian transit, certain incipient local advantages, and a Monroe Doctrine which it lacked the power to enforce.

It is therefore evident that any agreement with Great Britain which assured the effective internationality of the then proposed canal was not inimical to the interests of the United States in 1850.

This is what the Clayton-Bulwer treaty was designed to accomplish.

When the isthmian canal discussions between Mr. Clayton and Lord Palmerston had reached the stage of negotiations, Sir Henry Bulwer was then recalled from Madrid and dispatched to Washington to represent the British interests. That astute diplomat was more than a match for his less experienced conferee and had little difficulty in utilizing a temporary situation, unfavorable to the United States, as the basis for a permanent convention between the two powers.

In return for the proviso that England surrender her claims in Central America—that neither party should occupy, fortify, nor exercise dominion over any Central American state—the United States subscribed in perpetuity to certain principles with respect to isthmian transit. Most important among these was the agreement that neither should obtain nor maintain any exclusive control over interoceanic communications, whether rail or water. Fortifications also were proscribed, the two powers mutually guaranteeing the neutrality of the projected waterway.

In effect the United States surrendered, in this treaty, all future rights to exclusive jurisdiction over any Central American canal, in order to prevent Great Britain's extension of physical control over the then apparently most practicable route. This occurred twenty-five years after the famous pronouncement of President Monroe.

Nevertheless the Clayton-Bulwer treaty possessed timely merit. It secured the Monroe principle, which we were then unable to enforce by the pressure of power. It promised that our shipping would not receive adverse treatment. But it was defective in that it apparently contemplated the permanence of the international *status quo* and failed to provide for such modifications as the future might demand, an error

which must be attributed to the lack of vision of the short administration of Zachary Taylor.

This treaty met with immediate objection in the Senate, and was only accepted after explanations by Mr. Clayton which amounted, according to the later expressed opinions of some senators, to a misrepresentation of the intentions of the contracting parties. Subsequently and for the succeeding fifty years it was recurrently denounced in both Houses of Congress. But it remained a *bona fide* diplomatic bargain by which Great Britain traded tangible holdings in Central America for an acceptance of the principle of neutralized isthmian transit.

Soon after the ratification of the Clayton-Bulwer treaty preliminary plans were drawn for a lock canal across Nicaragua. While the necessary diplomatic and engineering details were being arranged, however, a group of United States citizens, headed by Cornelius Vanderbilt, organized a transportation service by steamer up the San Juan River and across Lake Nicaragua, thence by coach line to the Bay of Fonseca. This venture immediately proved successful and flourished until political difficulties together with competition from the Panama route forced its discontinuance.

In 1846 the Washington government had ratified an agreement with New Granada (later Colombia) extending certain rights for transit across the then state of Panama. Under this treaty the Panama Railroad was built, and was opened in 1855 under a pledge of neutrality guaranteed by the United States. The superior service offered by this route was in part responsible for the discontinuance of the land-and-water route across Nicaragua, and in fact served temporarily to postpone the construction of an all-water route across the isthmus.

The Nicaragua canal project therefore became dormant.

When De Lesseps succeeded with the construction of the Suez Canal some fifteen years later, however, world interest focused on the Central American isthmus as nature's remaining challenge to man. The genius of France accepted the challenge and under the leadership of De Lesseps undertook to repeat in America the accomplishment at Suez.

De Lesseps weighed the relative possibilities of Nicaragua and Panama, and finding the reaction of Colombia more favorable to his project, chose the latter route, although at the time admitting Nicaragua to be the most practical path for a lock canal.

With the arrival of De Lesseps in America, the diplomatic battle for the control of the canal route was resumed.

An optimistic report of the French engineers at Panama was submitted on February 14, 1880. During the same month the U. S. Navy took possession of a coaling station at near-by Boca del Toro.

On March 8 President Hayes, spurred by extensive news reports of the progress being made by the French syndicate, submitted a special message to Congress, in which he said:

> The policy of this country is a canal under American control. The United States cannot consent to the surrender of this control to any European power or to any combination of European powers. If existing treaties between the United States and other nations . . . . stand in the way of this policy . . . . suitable steps should be taken by just and liberal negotiations to promote and establish the American policy on this subject.

President Garfield, in his inaugural address shortly after, indicated his approval of this policy, and soon instructed his Secretary of State, Mr. Blaine, to initiate conversations with London, in order that the objectionable obligations of the Clayton-Bulwer treaty might "by just and liberal negotiations" be eliminated.

There is to be noted a fundamental difference between the canal policy of President Taylor and that of President Garfield. Earlier we did not aspire to dominate the canal, but undertook merely to prevent any other power from interfering with our free and equable use of any canal which might be built. Yet thirty years later we calmly announce our intention to control the canal, even though we had already solemnly surrendered our right to do so.

In the interim had transpired an era vital to the history of the United States.

The Monroe Doctrine, which should have been invoked to halt British pretensions in Central America early in the century, was vitiated by domestic politics during the two decades which preceded the Civil War. The issue of slavery cast a malignant shadow on Pan-American relations, and no aggressive foreign policy was possible until all questions as to stability of the Union had been definitely answered.

But after the reconstruction period it was appropriate that the United States should look abroad with confidence and should undertake to mitigate the errors of a less sophisticated age.

So it became the task of Mr. Blaine to undo the work of his predecessor, Mr. Clayton.

Athough Mr. Blaine undertook this work with energy and with no inconsiderable ability, his overtures encountered abroad an air of urbane complacency. When the British Foreign Secretary, Lord Granville, finally deigned to consider this question, the extent of his committal was that Great Britain found no objection to the existing agreement on isthmian transit.

Against this attitude the diplomacy of Mr. Blaine was unable to prevail. Public opinion at home ranged from mild regret to violent resentment over the spirit of Downing Street. But interest in the issue again waned with the collapse of French efforts at Panama.

The organization of M. de Lesseps, the Interoceanic Canal Company, ran afoul of French politics in 1888, and two years later it became evident that private enterprise was unable to cope with the tremendous task of building an isthmian canal.

So world affairs drifted leisurely toward the events of 1898.

After the Spanish-American War the demand for a waterway between the American continents again became insistent. This time it was not alone economic need that sought speedy water communications with the west. The famous voyage of the *Oregon* around Cape Horn illustrated most forcibly the military necessity for the long-broached canal. This military need was emphasized by the acquisition of Hawaii and the extension of national influence into the western Pacific. So President McKinley resumed the attempt to translate the dream of centuries into a tangible reality.

Thus it fell to John Hay, as Secretary of State, to present anew to Great Britain the desire of the United States for a nationally controlled canal.

The suave Mr. Hay knew his ground well, having returned from the Court of St. James to accept the portfolio of the State Department. And, above and beyond personalities on both sides of the Atlantic, there was abroad in a nation fresh from a victorious war, an unmistakable insistence that Great Britain surrender her isthmian pretensions to the more urgent needs of the United States.

Under these circumstances Lord Lansdowne receded gracefully from the position which had been maintained by his predecessor, so that representatives of the two governments were enabled to incorporate into the first Hay-Pauncefote treaty a modernization of the earlier Clayton-Bulwer treaty.

The basis of the new agreement was the theory of neutralization as expounded in the Convention of Constantinople of 1888, wherein rules were laid down for the international usage of the Suez Canal.

The modern Suez Canal was begun as a purely private enterprise of French conception, and at the outset did not have the serious consideration of a majority of the powers. Little of the necessary funds were raised outside of France. The British government was skeptical of the undertaking, and held itself entirely aloof until success was demonstrated. Then a remarkable *volte face* took place.

In 1875 Lord Beaconsfield (Disraeli) learned that shares comprising the Khedive's holdings in the canal were about to be sold. With startling promptness the entire block was purchased in the name of the British Empire, so that in a single stroke Great Britain became the largest individual shareholder in a successful private enterprise, the initiation of which she had actually opposed.

It was not the incidental profits which the Suez Canal offered, however, that interested the British government. By obtaining a substantial interest in the waterway Great Britain was able, if not to dominate its affairs, at least to insure its operation along lines not inimical to imperial interests.

So when the international convention was convened to formulate principles under which the Suez Canal should operate, Great Britain entered the conference as the largest single owner as well as the largest collective user of the waterway. Under these circumstances it is natural that the resulting treaty emphasized neutrality and nondiscrimination in the matter of traffic charges.

It is not irrelevant to note, however, that while the Suez Canal was also declared open to the use of vessels of all nations in war as

well as in peace, the oceanic approaches to the canal were actually controlled by Great Britain. From the Atlantic, Gibraltar had long been an outpost of the British Empire. From the Arabian Sea, Perim was annexed and fortified before the Suez waterway had been completed. It was therefore the economic more than the military neutralization of Suez that inspired the Convention of Constantinople.

This treaty, which for a decade had furnished the diplomatic setting for the canal between Europe and Africa, was looked to as establishing precedents which should likewise apply in the Western Hemisphere.

The first attempt of Hay and Pauncefote to write an American canal treaty along these lines, however, was unsuccessful.

Their treaty encountered opposition in the Senate, which body proposed two important revisions: that the abrogation of the Clayton-Bulwer treaty be specifically adverted to in the new convention, and that the clause which prohibited fortification of the canal be nullified.

Mr. Hay decried the refusal of the Senate to accept his treaty as written, apparently so satisfied with the efforts which had achieved at least partial reversal of a British foreign policy of a half century that he feared to jeopardize his success in further *pourparlers*. But he set to work without delay, and was able within a short time to bring about an entirely satisfactory rapproachement of conflicting interests which must stand out as one of the notable achievements of American diplomacy.

The textual differences between the two Hay-Pauncefote treaties are so slight that a careful reading of the diplomatic conversations leading up to the second treaty is necessary to silhouette the historical significance of these revisions.

In deleting the reference to fortifications, which had been carried forward from the Clayton-Bulwer treaty, the right of the United States to arm the canal as a matter of national defense was tacitly conceded. Thus while the application of the essential features of the Convention of Constantinople were preserved, a control geographically analogous to that exercised by Great Britain at Gibraltar and Perim in the case of Suez was insured to the United States.

The second treaty is also somewhat more specific than the first. While originally the Nicaragua route alone was under consideration, the revised treaty mentions, in the singular, a canal "by whatever route may be considered expedient." This phrase has the significance of tying the treaty particularly to the undertaking then in hand, and, as events shortly developed, to the Panama instead of to the Nicaragua route.

Most important, however, was the insertion of the article:

> The high contracting parties agree that the present treaty shall supersede the aforementioned convention of the 19th April 1850.

Thus, while the "general principle" of neutralization as defined in the Clayton-Bulwer treaty was carried forward to the second Hay-Pauncefote treaty, its application was limited by the context of the latter to the present canal. The Marquis of Lansdowne, British Foreign Minister, was wholly cognizant of this inference, and attempted to have the treaty so worded as to apply also to subsequent waterways. But his suggestion was gracefully waived by the Washington government on the plea that the construction of more than one canal was highly improbable and that the fettering of the contracting parties any further than to the immediate project was subject to the same objections as was a continuation of the Clayton-Bulwer treaty.

The second Hay-Pauncefote treaty was ratified in December, 1901, and forthwith established the international guaranties under which the existing canal was built.

It is to be noted that in the course of the negotiations leading to this end, Great Britain surrendered one by one important advantages, despite the diplomatic leverage afforded by the Clayton-Bulwer pact which Downing Street insisted to the end to be a valid and binding contract. "So far as Her Majesty's Government were concerned," states Lansdowne, "there was no desire to procure a modification of that convention." Yet in the end the convention was modified, and that very much in favor of the United States.

On the other hand Great Britain was relieved by the new treaty of all responsibility for maintaining the neutrality of the waterway. Likewise the entire financial burden of construction was assumed by the United States, with assurance that traffic charges would be shared on "a fair and equitable" basis. The net result of the bargain was

to secure for Great Britain the principle of neutralization, which was so definitely written into the pact as to withstand very serious assaults during the Panama tolls controversy.

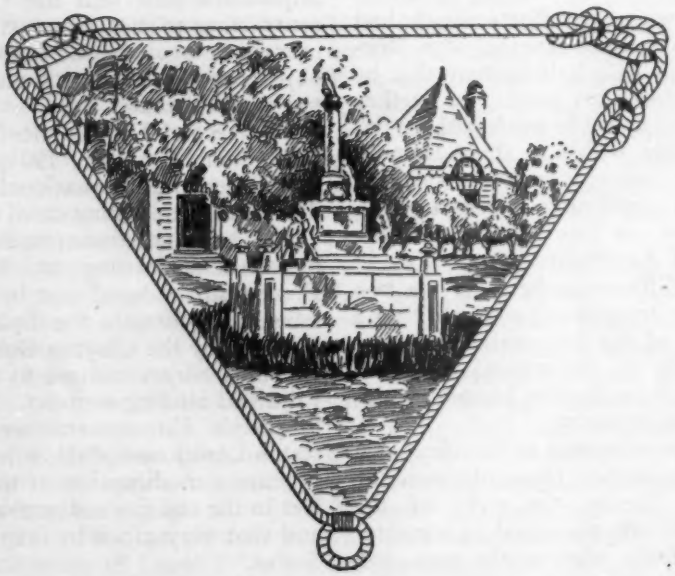
Now comes the time, unforeseen thirty years ago, when a second canal is needed.

The question to be decided is therefore whether the United States, having fulfilled its duty to civilization in providing an isthmian waterway "free and open to the vessels of commerce and war of all nations on terms of entire equality," and having observed the spirit of an agreement entered into in a relatively remote era, may now proceed to build another canal dedicated entirely to its own purposes and without entangling alliances beyond the working agreement with the local government.

The British answer to this question may be that Lord Lansdowne, in consenting to the abrogation of the Clayton-Bulwer treaty by the Hay-Pauncefote treaty, did so with the understanding that the principle of neutralization as originally propounded was being perpetuated by the preamble to the latter document.

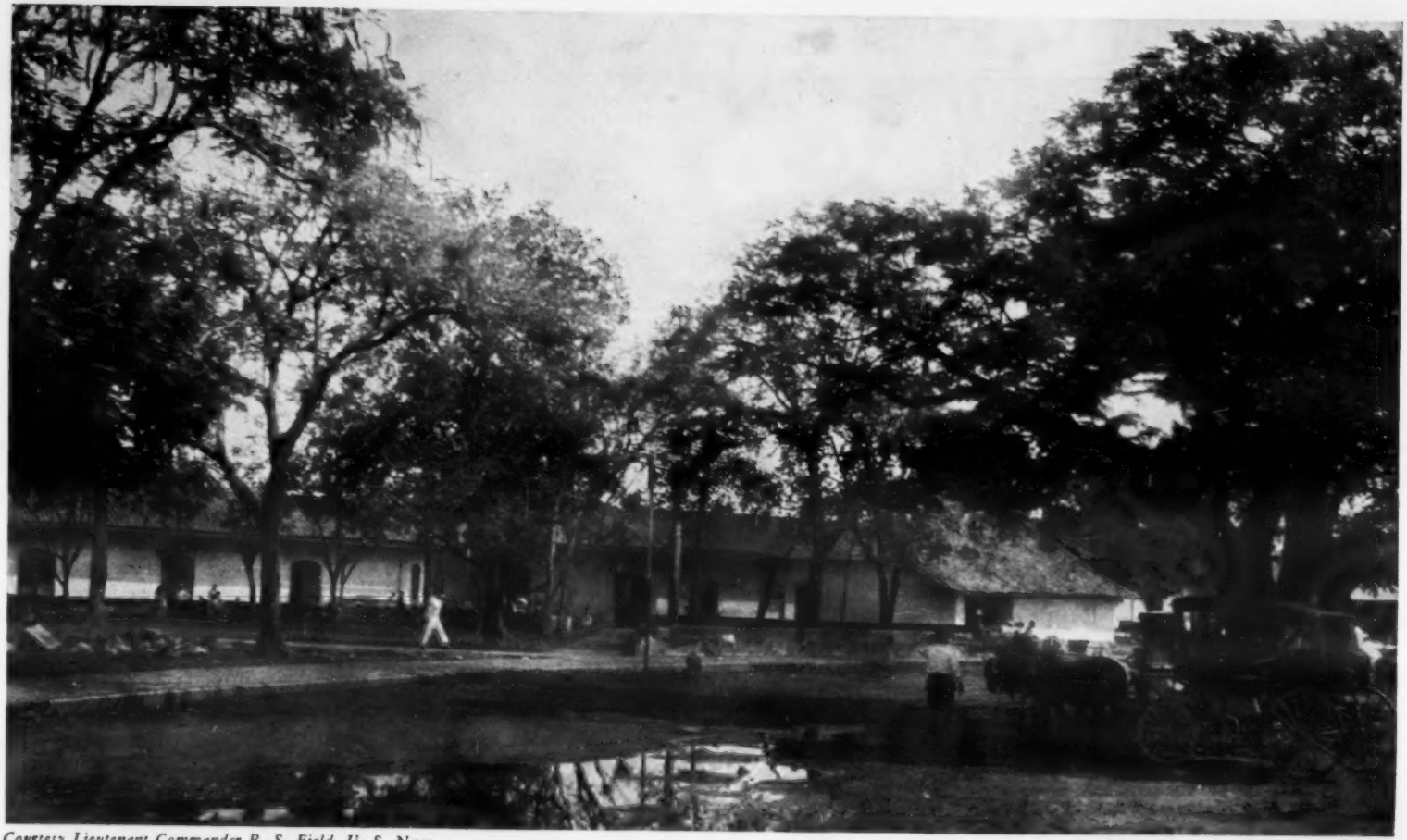
And the Washington response may properly be that the phrase "without impairing the general principle of neutralization" had reference only to the project then in hand—the present Panama route; and that President McKinley definitely declined to further commit the United States in the matter of canal policy.

This problem will call for the highest degree of statesmanship, since it touches a matter vital to future maritime leadership.



Courtesy Lieutenant Commander R. S. Field, U. S. Navy

VOLCANIC LAKE NEAR MANAGUA
Lake Managua in the background.



Courtesy Lieutenant Commander R. S. Field, U. S. Navy

LEON, NICARAGUA

Courtesy Lieutenant Commander R. S. Field, U. S. Navy

PARK CORINTO, NICARAGUA

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RAILROAD STATION, MANAGUA

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CORINTO HARBOR, NICARAGUA

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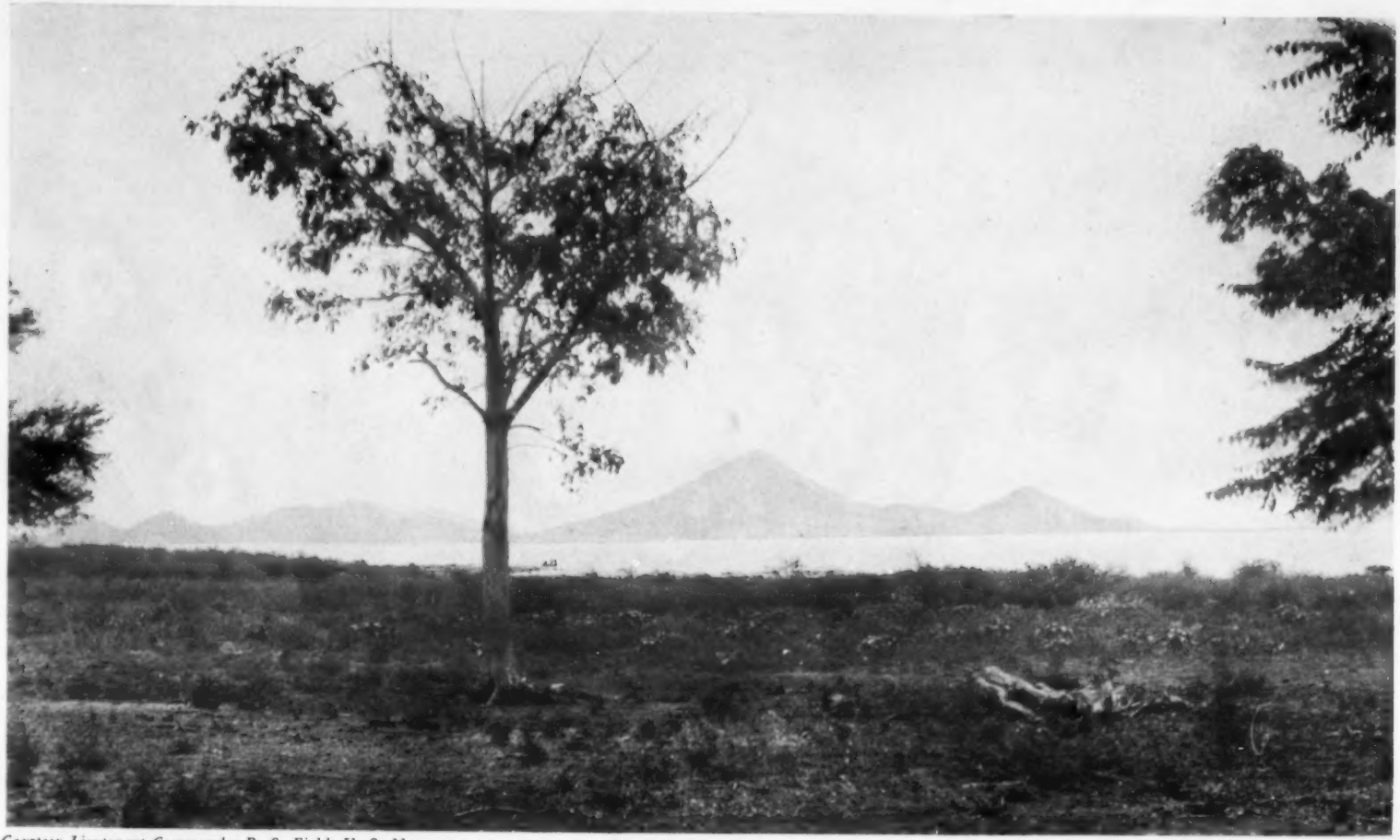


Courtesy Lieutenant Commander R. S. Field, U. S. Navy

LAKE MANAGUA

This lake would form a portion of the proposed Nicaragua canal. Momotombo and Momotombito are in the distance.

The Cruiser Problem

By LIEUTENANT FRANKLIN G. PERCIVAL, *U. S. Navy (Retired)*

In the designing of a cruiser as of any class of warship, the first step before which none should be taken, is to decide the primary object to be realized—what is this ship meant to do?—MAHAN

IN THESE simple words Mahan sets forth the basis of all intelligent warship design. Once we have answered the question, "What is this ship meant to do?" we know the offensive armament and speed necessary to accomplish the allotted task; while the hazards which will probably be encountered give us the defensive armament and protection necessary to provide reasonable insurance that the vessel will be able to meet those hazards. Hence we have a criterion by which we can test the soundness of the design of any type of warship. In applying it to cruisers, however, we must bear in mind that new weapons have changed not only many of their functions but also the risks to which they are exposed.

It is with recent and proposed future cruisers that this paper is mainly concerned. Since the post-war cruiser building programs of the leading powers have taken sufficiently definite form to enable us to draw conclusions as to the conceptions underlying the various designs, we propose to test them by Mahan's criterion and, in addition, to study them in the light of history. Then, profiting by the good points and weaknesses of the various cruisers as developed by this study, we shall propose a solution of the cruiser problem as it exists today in the U. S. Navy.

Lessons from the past illuminate the cruiser situation as well as any other naval problem. If we study the development of this class of ships, we see one outstanding fallacy regularly recurring. Accordingly, the following section is devoted to tracing briefly the evolution of the cruiser, and to a careful study of recent designs, applying both Mahan's criterion and the light of history.[1]

[1] A detailed account of this development is to be found in Hovgaard's *Modern History of Warships*, from which excellent work much of the material in the following section has been obtained.

HISTORICAL

The first of the steam-driven cruisers were apparently inspired by the remarkable career of the Confederate commerce destroyer *Alabama*. Since they were designed for overtaking and capturing practically defenseless merchant vessels, speed and gun power were sought after, while very little thought was given to armor. Then, naturally, men began to think of a counter to these raiders with a view to commerce protection.

In considering cruisers for the defense of trade, designers realized, of course, that such vessels mut be able to defeat the powerfully armed commerce destroyers. This implied the ability to stand a reasonable amount of punishment. These ideas as to the necessity for protection ripened into conviction after the unsuccessful action fought by the unarmored British cruisers *Shah* and *Amethyst* against the Peruvian armor-clad *Huascar*.

Here we see a trend of thought which has since repeated itself nearly every time that a new class of cruisers has been evolved. In bringing out the new type, designers usually have seemed to picture their creation *only* as a destroyer of some smaller and weaker type which preceded it. This unfortunate conception has resulted in ships with plenty of speed and gun power but very little protection. Other powers have invariably replied with a vessel of similar or slightly greater displacement, and usually with a better balanced design, which the first type could not meet on terms of equality, and consequently became obsolete. Under the circumstances, the speed and the gun power were necessary. What was objectionable was purchasing them at the expense of protection and thus disqualifying the cruiser for subsequent encounters with similarly gunned vessels.

The first attempts at cruiser protection consisted of fitting an armored deck and arranging the coal bunkers to shield the ship's vitals. As time went on, the offensive type was given more armament and speed with some protection. This necessitated more weight for guns and armor for the defensive type. Any increase in size by one power was promptly followed by the others. Thus displacements and costs steadily mounted until the armored cruiser was evolved; this class, in turn, increased in size until it was only slightly smaller than contemporaneous battleships.

When Fisher brought out the *Dreadnought*, the armored cruiser developed into the battle cruiser. The British designers seemed to make the usual mistake and pictured the battle cruiser as fighting the smaller and weaker armored cruiser which preceded it, for they protected their first vessels of this type with only a six-inch armor belt. The German designers, however, realized that their battle cruisers must fight similar ships and upon occasion, battleships. Consequently, they insisted upon a well-balanced design, even though it necessitated some sacrifice of speed, cruising radius, and armament. That the early British design was an admirable destroyer of armored cruisers was strikingly demonstrated at the Falklands; but that the German design represented the sounder view was even more strikingly demonstrated at Jutland. As a result of their experience at the latter battle, the British sharply modified their views and in the design of the *Hood* they insisted on adequate protection without any sacrifice of speed or gun power, despite the fact that this necessitated the enormous displacement of 41,200 tons. It is noteworthy that even this huge increase in size was promptly followed by both the United States and Japan.

We must, however, go back a little to complete our brief sketch of the cruiser. About 1906, Russia brought out the *Novik*, a small, fast, lightly armed cruiser with some protection, designed primarily for scouting. In appearance, it resembled a large destroyer. The British realized the utility of such a vessel and replied with the *Pathfinder* class. As the shortcomings of these scouts were appreciated, the type developed into the light cruiser. The latter was scantily armored at first; but, as is inevitably the case, more armament and protection were added with the usual increases in displacement. The design became standardized during the late war at about 5,000 tons, with an armament of 5.9- or 6-inch guns, several torpedo tubes, an armor belt three or four inches thick, and a speed of 28 to 30 knots.

During the World War, the British produced two types of ships as destroyers of light cruisers. The first was Fisher's *Courageous* class of light battle cruisers with a displacement of 19,000 tons, a speed of 31.5 knots, and an armament of four 15-inch guns in twin turrets, besides eighteen 4-inch in triple mountings. The other design was the *Raleigh* class of 9,750 tons, 29 knots, seven 7.5-inch guns mounted behind gun shields, several smaller antiaircraft guns, and some torpedoes. Both of these designs were given an armor belt of only three inches, since they were intended to fight light cruisers armed with 5.9-inch guns.

The circumstances under which the first of these vessels were designed and built differed radically from those ordinarily prevailing. War had already been declared and it promised to be long enough to insure the completion of the projected vessels in time to be of service, while not being long enough to enable the Germans to build a counter thereto. Furthermore, in the early days of the war, the British shipyards turned out work with extraordinary rapidity, and there was no limit to appropriations. Under these special circumstances, a design to destroy existing ships was undeniably sound; although, with the wisdom which comes after the event, it is easy to see how both designs could have been improved.

History, nevertheless, has demonstrated unmistakably the folly of building cruisers in peace time with the sole aim of rendering obsolete their smaller and weaker predecessors, while ignoring the fact that other powers will inevitably reply with cruisers of similar or even greater displacement and usually with a better balanced design which the would-be supercruiser is unable to face. Hence it follows that in designing any cruiser we must remember that inevitably it will be compelled to fight ships of similar displacement. If it is able to do that, the weaker predecessors are usually taken care of automatically.

Formerly, no matter how well balanced a cruiser might be turned out, it could promptly be outclassed by another equally

well-designed but larger cruiser. This was one of the most fruitful causes of competitive building. The Washington treaty, fortunately, has put an end to all that by setting a limit to cruiser displacements. Now, one can build a well-balanced 10,000-ton cruiser with the assurance that it will be considered an effective unit during its entire life.

This treaty ushered in a new era in cruiser construction. All leading powers except the United States began immediately to build cruisers with the maximum allowed displacement of 10,000 tons and guns of the maximum allowed caliber of eight inches. Since their speeds ranged from 32 to 36 knots, they were in reality only enlarged and faster *Raleighs*. In fact, the speedier of them had the objectionable feature of the *Raleighs*, the lack of balance between armament and protection, in an accentuated form; for the armament had been increased while armor had been reduced to almost nothing. In appearance the new type more nearly resembled miniature battle cruisers, due to the fact that, as a result of war experience, their main batteries were housed in turrets instead of behind gun shields. Even the slowest and most stoutly protected of these vessels had the same defect as the early British battle cruisers in that their protection was hopelessly inferior to their armament. This made them excellent ships for striking down the war-time light cruisers, but they could not be considered well-balanced designs for fighting ships of their own type.

As usual, however, history repeated itself. More thought was given to defensive strength and, in the *Ersatz Preussen*, the Germans brought out a cruiser which, on 10,000 tons, not only had adequate protection against 8-inch shells, but also had a battery of much greater power than any contemporary cruisers. They accomplished this feat, partly by cutting its speed to the modest figure of 26 knots and partly by remarkable skill in its design, as well as by the fact that the Versailles Treaty permitted them to mount a battery of 11-inch guns while the Washington treaty limits other powers to 8-inch guns for cruisers.

Aside from the remarkable skill shown in reducing hull, armor, and machinery weights, there are several points in the design of this vessel which deserve careful attention. First of all, the Germans recognized that the importance of speed had been greatly exaggerated, and that for most *present-day* cruiser functions, it was not worth the exorbitant price which was being paid for it. Next, they realized the value under modern conditions of a rapid rate of acceleration, and adopted the Diesel engine, which also gave these ships a remarkable cruising radius. They further saw that any ship as large as 10,000 tons should have reasonably adequate protection against the projectiles which it must encounter in the normal performance of its duties. Another point they grasped was that the requirements for a satisfactory aircraft carrier and a good gun platform differ so fundamentally that any attempt to combine the two types would result in failure; so they concentrated on building a good gun platform. Finally they perceived that where weight was at such a premium and where the projectiles fired by their main battery could so easily defeat the armor carried by contemporary cruisers, it was sound judgment to reduce the number of guns in the main battery to six, in order to save the weight needed for protection. These points will be discussed more fully in subsequent sections.

In the meantime, other powers showed a tendency to stray away from the standardized 10,000-ton cruiser. Japan led off with the *Furutaka* class of 7,100 tons, 33 knots, and six 8-inch guns. England followed with the 8,400-ton, 33-knot *York*, also carrying six 8-inch guns. These designs seem to be even more poorly balanced than that of the 10,000-tonners, which class they cannot meet on terms of equality. Hence they must have been conceived as destroyers of smaller cruisers. Even in this rôle they are inferior to the larger vessels. Although their designers may have had something else in view, it is obvious that this type would not meet our needs.

The British themselves must have regarded the design as unsatisfactory, for they announced recently that, instead of building more *Yorks*, they would lay down cruisers of only 6,000 tons with a main battery of 6-inch guns. Italy also has announced a program of six 5,300-ton, 38-knot cruisers. Since neither of these latter types can fight the 10,000-ton class, they must be regarded as destroyers of destroyers, or as commerce raiders. They probably meet the require-

ments of their builders; but, from our viewpoint, they appear to be unnecessarily large for attacking merchant vessels, and too small to deal with large cruisers supporting hostile destroyers.

There is one other trend in cruiser design to be considered. Japan has brought out the *Yubari* of 3,100 tons, six 5.5-inch guns, four torpedo tubes, a 2-inch armor belt and 33 knots. France has built several destroyers of 2,400 to 2,700 tons, 35 to 37 knots, five 5.1- or 5.5-inch guns, six torpedo tubes, and no protection other than that they have unusually rugged hulls. Although both types seem to have been built primarily for flotilla duties, they have the necessary striking power, cruising radius, and seaworthiness for the performance of certain cruiser functions. Eventually this type will probably eliminate the 1,000- to 1,500-ton destroyer, whose limited cruising radius makes it strategically, and whose low speed in bad weather makes it tactically, the lame duck of the fleet.

This brings us up to the present; we have yet to consider the types of cruisers best suited to our future needs. Since, according to Mahan, the soundness of any given design is determined by its fitness to perform the allotted tasks, it behooves us to think what these ships will have to do. That the duties of cruisers are as varied as those of all other types of warships put together is not generally realized. There are, for example, certain cruiser functions such as scouting and raiding which call for high speed and the maximum striking and resisting power that can be obtained after that speed has been provided. Obviously, for these duties, we want the nearest thing we can get to a battle cruiser on 10,000 tons and a battery of 8-inch guns. Then there are certain duties which require only a moderate speed, but demand the maximum in armament and protection. Clearly they can best be executed by the nearest thing we can get to a battleship on 10,000 tons and a battery of 8-inch guns. We can go on down through the various classes of warships and find corresponding cruiser types. Accordingly, in the following sections devoted to the study of the types best suited to performing the various *present-day and future* cruiser functions, we shall refer to them as the battle cruiser type, the battleship type, the aircraft carrier type, etc.

The Battle Cruiser Type

Under this heading, we group cruisers of from 7,100 tons to 10,000 tons standard displacement, 7.5- or 8-inch guns, and 29 to 36 knots speed. Our first question is: "What is this ship meant to do?" In view of the exorbitant price which must be paid for high speed, we conclude that these vessels were designed primarily for those functions in which maximum mobility is an absolute necessity. These are: scouting, supporting or breaking up destroyer attacks, raiding, and hunting. The first of these rôles has been taken over by scouting planes in such weather as permits their operation. It is consequently of greatly reduced importance and will likely continue to diminish with probable improvements in planes and aërial navigation. Hence, scouting must now be considered a secondary rôle for these cruisers. The primary fleet function of this type is, therefore, assisting or repelling the onslaughts of destroyers. This view is supported by the fact that both England and Italy have recently announced the laying down of cruisers which appear to be designed to fight torpedo craft rather than other cruisers. Our problem is, then, to design a cruiser with the primary object of supporting or breaking up destroyer attacks, while not losing sight of its suitability for raiding, hunting, and scouting.

In deciding what sort of cruiser is best adapted to this duty, the first thing to be settled is its size. The small cruiser has the advantage that it affords a reduced target to gunfire, has greater maneuverability, and that its 6-inch guns are probably better suited to fighting destroyers than are the 8-inch guns of the larger cruiser. The trouble is that they will have to fight and defeat other cruisers before they can turn their attention to the hostile destroyers. When it comes to engaging the former, the advantages of size and gun power are apparent; and we see the futility of building a warship with the sole idea of fighting a smaller and weaker vessel, while ignoring the fact that it must be able to fight ships of its own class.

Besides the usual well-known reasons why we should adhere to the maximum displacement allowed by the treaty, an additional one is that the more expensive individual units become, the more is competition slowed down in that class. It now seems

likely that only the three leading naval powers will build 35,000-ton battleships, and it is noteworthy that only the six leading naval powers are building 10,000-ton cruisers. The minor navies have turned to smaller cruisers, destroyers, and submarines as the only types in which they care to compete. Hence, it is clear that the cause of the limitation of armament is advanced by keeping up the cost of individual ships, and that we should proceed by reducing the number of units, not their size.

One argument against the big cruiser is that it is large enough to afford a tempting target to the main battery guns of battleships. It seems very unlikely, however, that any destroyer attack will be pushed home, except under cover of darkness or a smoke screen, unless the enemy battleships are so closely engaged with our own that they cannot afford to turn their big guns elsewhere. A 10,000-ton ship, moreover, affords only a slightly larger target than one of 6,000 tons. This argument, therefore, need not be taken too seriously. If we agree on this point, the obvious conclusion is that the displacement of these cruisers should be the maximum allowed by the treaty.

Since this type must be designed primarily for fighting other cruisers and secondarily for fighting destroyers, it is obvious that it should have more protection than has been given earlier vessels of this class. The battle cruiser action at Jutland demonstrated too clearly the folly of putting everything into guns and speed, while forgetting that the gun platform must be kept afloat, the guns in action, and the propulsive machinery intact. Manifestly, these ships should have reasonably adequate protection against 8-inch shells. This would automatically provide immunity to any projectile fired by destroyers or destroyer leaders, even though the range be point-blank. It would also take care of medium sized bombs. Such protection can be obtained only at the expense of armament or speed or both. How much may these qualities be reduced?

To begin with, it is proposed that the number of 8-inch guns be reduced to six, mounted in two triple turrets. There can be no question that this battery is sufficiently powerful to sink in short order any treaty cruiser afloat today. The 8-inch shell can so easily defeat the armor carried by these large, scantily protected vessels, that it is simply a matter of getting on the target. This is one of the points recognized by the Germans when they put only six guns in the main battery of the *Ersatz Preussen*.

The previous tendency to overgun these cruisers has been justified by quoting Farragut's famous maxim: "The best protection against the enemy's fire is a well-directed fire from our own guns." Although it would be the height of presumption to question the wisdom of Farragut, ought we not to consider the circumstances under which he made the statement? In the first place, he was not discussing the proper characteristics for future construction; he was courageously facing the difficult task of capturing New Orleans with the obsolete ships at his command. Next, he had already done everything in his power to protect these vessels and their personnel, such as rigging splinter nets, securing chain cables along the ships' sides, and placing hammocks, bags of sand, coal, and ashes to protect the ships' vitals. He had even daubed them with mud to make them less conspicuous. The only thing left to do was to point out the importance of good shooting. He was, moreover, attempting a task of the utmost seriousness with his old wooden ships, and may have considered it advisable to direct attention away from their obvious lack of protection. Finally, it should be noted that, after monitors became available, he was perfectly willing to await their arrival before entering Mobile Bay. Were these the acts of one who scorned protection? If we judge the man by what he did, rather than by this much-quoted sentence, is it not clear that this great apostle of the offensive realized keenly the importance of defensive strength, and would have been the last to advise stripping cruisers of armor in order to overload them with guns?

Nobody questions either the offensive necessity or the defensive value of well-directed gunfire; but, in the piping times of peace, many of us forget that this depends upon several things besides the number of guns. First of all, the gun platform must be kept afloat and on a reasonably even keel, with the machinery intact, while the guns and operating personnel must be behind sufficient armor to enable them to continue to function in spite of a few hits. All of this calls for protection, since we must expect the enemy to open fire as soon as we do.

Next, there comes the relative skill of the operating personnel. Armor begets confidence and makes for increased efficiency under the trying conditions of battle. Last of all, there is the element of chance. This is far more apt to go against a cruiser which has so little protection that it can be blown up by a single lucky hit than it is to go against one capable of standing a reasonable amount of punishment. So, on closer examination, we see that robbing a vessel of armor in order to overload it with guns reduces rather than increases its chances of maintaining a well-directed gunfire *under the conditions of actual battle.*

Then, if we succeed in defeating the hostile cruisers, our own cruisers must be able to deal with destroyers. For use against these totally unprotected vessels, the 8-inch gun is unnecessarily large and too slow in firing. Of course, the main battery should be turned against destroyers after the larger ships are out of the way, but it must be supplemented by something else. The exposed position which these cruisers must take at times in the discharge of their duties demands that they be given an unusually powerful antiaircraft battery. The weapon now most favored for this purpose is the 5-inch gun. If several of these were mounted with due consideration for their arcs of fire, they could be used with great effect against destroyers. This gun possesses ample range and destructive power to deal with such vessels. When we have obtained these qualities, any increase in caliber simply represents wasted energy and, of greater importance, wasted tonnage. Although, in the absence of concrete designs, one cannot be dogmatic, a battery of nine 5-inch guns mounted in three triple turrets would prove highly effective against either destroyers or aircraft. These should be supplemented by several automatic guns, also mounted in turrets, and the usual torpedo armament.

The next question is, how far do we dare reduce the speed of these cruisers in order to meet the other requirements and still enable them to discharge their allotted functions? It has long been an article of faith that they should be slightly faster than contemporary battle cruisers. This claim is now of greatly reduced importance. To begin with, the cruiser has been displaced by the airplane for scouting in clear weather. In any contact in thick weather, the outcome will not depend upon a slight difference in speed.

When these cruisers are used for independent duty, they now face a different situation, due to the aërial scout. This means that contact will usually be established at much greater distances than formerly. Suppose, for example, that one of these vessels discovers a superior force sixty miles away, that the pursuit is started immediately, that the pursuers have a four-knot superiority in speed, and that there remain ten hours of daylight. The pursuers will gain only forty miles and still be twenty miles away and hopelessly out of range when darkness falls. Of course the situation might be such that the slower vessel could be overhauled, but our point is that a few knots difference in speed is not the crucial matter that it was when contacts were made at visibility distance.

Future hunting squadrons, however, will probably be accompanied by an aircraft carrier whose planes will be launched in attacks as soon as the raider is discovered. Then the safety of the raider will depend upon its antiaircraft batteries and protection, rather than upon extreme speed. The latter quality will never enable any class of surface vessel to run away from any aërial attack. We may say that, in the average situation, *speed alone no longer spells safety for a cruiser or any other type of warship.* That dearly bought quality will seldom be needed for avoiding other surface vessels, thanks to the aërial scout, and is of negligible value for avoiding aërial attacks, while *safety and, of greater importance, combat efficiency do depend upon those qualities which can be obtained only by sacrificing speed.*

Another point in this connection is that, if the Washington treaty remains in force, it is doubtful if any more battle cruisers will be built. If they are built, it is fairly safe to say that their speed will not be over 28 knots.

If we agree that speed is of greatly reduced importance for either pursuit or escape and that a few knots either way make comparatively little difference, what is the maximum speed that can be attained after first providing the armament and protection previously specified? If we may judge from existing ships, this would probably be 30 knots. When the Japanese were able to get

six 8-inch guns and 33 knots on 7,100 tons in their *Furutaka* class, we should be able to get six somewhat longer 8-inch guns, a stronger antiaircraft battery and adequate protection on 10,000 tons, particularly since we are reducing the speed from 33 to 30 knots.[2]

Even if it were necessary to drop to 29, or possibly as low as 28 knots, it is submitted that the resulting design would still be better able to meet the changed conditions of modern war at sea for the following reasons: it could defeat in a gun fight the present 10,000-ton cruiser of 31-36 knots; it could cope more effectively with destroyers than that type; it would be better fitted to meet the aërial menace because of its protection and its powerful battery of sky guns; it would be even more effective as a destroyer of destroyers than the small 6-inch gun cruiser, because it would have sufficient protection to be immune to any gun carried by a destroyer, and because its 5-inch battery would be as effective against the destroyers as the 6-inch battery of the small cruiser, while the addition of the 8-inch battery would be so much clear gain; it would still have enough speed to operate with destroyers, to keep clear of probable future battle cruisers and, with aërial scouting, it should be able to avoid even the present 32-knot vessels of that type.

We advocate then, a battle cruiser type of cruiser having a displacement of 10,000 tons, six 8-inch guns, nine 5-inch guns, several automatic guns, two triple torpedo tubes, 28-30 knots speed, the usual aviation equipment, and reasonable protection against 8-inch shells.

There is one point in connection with the Washington treaty that is frequently overlooked. This is that when a maximum displacement of 10,000 tons was established, a new situation was created. Formerly, any combination of speed and fighting power was possible if one were willing to pay the price. Now, with displacement limited, every ton devoted to high speed means that just so much less is available for guns, ammunition, and protection. Since any cruiser exists primarily for fighting, since fighting requires the ability to absorb as well as deliver punishment, and since the degree of striking and resisting power which we can give one of these cruisers is dependent upon how much we have been able to cut its speed, it follows that we should classify cruiser functions according to the mobility required, and assign a cruiser no higher speed than it absolutely must have for the execution of its allotted tasks. The question naturally arises then, is there not a field of usefulness for an even slower type? This is taken up in the next section.

[2] Just as copies of this paper were mailed to various officers for criticism, the December PROCEEDINGS arrived. In it was a paper by Professor Hovgaard in which he advocated a 10,000-ton cruiser having the identical main battery and protection just specified for our battle cruiser type. He did not, however, see what we consider to be the necessity for a strong 5-inch battery for use against destroyers and aircraft. He estimated that his cruiser could be given a speed of 29 knots. According to this authority then, we could not hope for a speed above 28 knots for our proposed battle cruiser type. Professor Hovgaard's estimate seems to be very conservative in view of what Japan has gotten in the *Furutaka*, Germany in the *Ersatz Preussen*, and England in the *York*.

THE BATTLESHIP TYPE

The only existing specimen of this class is the *Ersatz Preussen*. With its six 11-inch, besides eight 6-inch and four 3.4-inch guns, and ample protection against 8-inch shells, this vessel has justly been hailed the most powerful 10,000-ton warship ever built.

Even this supercruiser, however, has its limitations. It cannot overtake the present type of treaty cruiser, but can usually defeat it if circumstances compel the latter to fight. If, for example, the *Ersatz Preussen* were escorting a convoy or screening some aircraft carriers which the high-speed cruisers were ordered to attack, the latter could not do so without first defeating the defender. Or, if the faster vessels were assigned a defensive mission where they must stand and fight, the German armored cruiser could probably defeat them. If, however, visibility conditions necessitated fighting at such short range that the 8-inch shells of the fast cruiser could pierce the armor of the *Ersatz Preussen*, would not the greater rapidity and volume of fire of the 8-inch battery more than offset the greater destructiveness of the 11-inch shells with the result that the slower firing vessel would be defeated?

Can we not build a cruiser within the limitations of the Washington treaty capable of doing everything that this German creation can do, while still having rapidity and volume of fire for short-range contacts? We could build one with nine to twelve 8-inch

guns, a powerful battery of 5-inch and small automatic guns with some torpedoes, protection against 8-inch shells, and a speed of 21-25 knots, the latter quality to be decided by the speed of our next battleships. Although this vessel could not overtake the fast cruiser, circumstances may compel the latter to advance and fight or to stand and fight, in which event our proposed cruiser could defeat it. The *Ersatz Preussen* could do no more, although theoretically its bigger guns would enable it to open fire sooner than could a cruiser with 8-inch guns. Practically, however, visibility conditions would usually prevent it from taking advantage of the superior range of its main battery.

It is likely that our proposed battleship type of cruiser will usually be employed on defensive missions such as protecting convoys, screening the fleet at night or in thick weather, protecting aircraft carriers during an action, or breaking up destroyer attacks. For these duties, it would actually be more effective than the *Ersatz Preussen*. Against thinly armored vessels, its 8-inch shells would have ample penetrating and destructive power and, if engaged with superior numbers, its more numerous battery and greater rapidity of fire should be a great advantage; just as, when it comes to driving rivets, twelve pneumatic riveters would be far more effective than six sledge hammers. Nor would it be handicapped in short-range contacts as is the German cruiser.

The specification of a main battery of nine to twelve 8-inch guns for these ships may seem inconsistent with what was said in the preceding section when only six 8-inch guns were specified for the battle cruiser type. It is not inconsistent, however, because if we attempted to give a 28-30-knot cruiser enough guns to engage two large cruisers, the protection would have to be cut to almost nothing. Hence, its chances of staying afloat long enough to carry out its mission would be negligible and it must be rejected as an unsound design. On the contrary, the proposed battleship type of cruiser would have such stout protection that it could engage two or even three of the fast, flimsily protected cruisers with reasonable chances of success and it should be given sufficient armament to enable it to do so.

If we agree that our proposed battleship type of cruiser is the equal, if not the superior, of the *Ersatz Preussen* for fighting the frail treaty cruisers, how would it fare if confronted by this German armored cruiser? It could not, without aërial superiority, stand up to the heavier guns carried by the *Ersatz Preussen* in a long-range engagement; but it is noteworthy that the latter type or a superior vessel can be built only by the weaker naval powers, and only out of capital ship tonnage. If we should become involved in a war with such a power, we would not only have our own capital ships available to escort convoys; but also, if they used their smaller capital ships for commerce raiding, we would have an excellent opportunity to cut off and destroy them. In any war with a weaker navy, the chief difficulty is to entice their vessels out for an engagement. If they employed their capital ships in destroying commerce, they would simply play into our hands.

Nor should we need battle cruisers to run them down. An aircraft carrier, accompanied by a battleship and four to six large ocean-going destroyers, would form an ideal hunting squadron. The planes of the carrier would be invaluable for locating the raider. If he sought to escape, the planes would constitute a striking force of great power and of incomparably higher speed than any battle cruiser. They could certainly disable, if not destroy him. If he were disabled or were inclined to stand and fight, the battleship could soon settle things. The destroyers would provide the necessary offense and defense for contacts in low visibility, as well as constituting an antisubmarine screen in clear weather. Thus we would have an invincible combination, regardless of weather conditions.

That is all very well for the weaker navies, but how about the use of our proposed battleship type of cruiser for protecting convoys against one of the leading powers? American naval officers naturally remember the keen anxiety they felt over the safety of our troop convoys in the autumn of 1918, when they feared a final desperate sally by the German battle cruisers. Here, we may as well face the fact that there is no such thing as *absolute* safety for convoys. Even when the British were protecting their Norwegian convoys with a full division of battleships, the Germans brought out their entire fleet to raid a convoy. Only the stripping of one of the *Moltke's* propellers, and poor timing of the raid, prevented

a very bad day for the Allies. Reasonable safety for convoys, however, can be provided, as indicated in the next two paragraphs.

The prime requisite is that the fleet base be so chosen with respect to convoy routes, or convoys so routed with respect to the fleet base, that no hostile raiding force can reach those vital arteries of supply without serious risk of being cut off and destroyed by our entire fleet. If, for example, there were war in the Pacific with our fleet based on Manila, the convoy route between that port and Hawaii would constantly be exposed to raids in force. The obvious counter would be to send convoys from Panama across the Pacific by the southern route, via Samoa, instead of by the northern route, via Hawaii. As pointed out by Captain Knox some years ago, the former has the advantage of being somewhat shorter, in addition to being much less exposed. Or, if the steaming radius of future vessels and other conditions should permit, we could send convoys out east bound, via Suez. If that canal were unavailable, we could fall back on the route via the Cape of Good Hope. In either of the two latter cases, convoys would be practically immune to raids in force.

The second condition is that each convoy be provided with an escort of sufficient strength to necessitate a stronger raiding force than the enemy could afford to risk for the possibility of destroying the average convoy. One cruiser of our proposed battleship type with an antisubmarine screen, and a merchant vessel converted into an aircraft carrier, should admirably fulfill the requirements. This escort would necessitate a raiding force consisting either of a capital ship and an aircraft carrier, or of an aircraft carrier and an overwhelming number of cruisers. The possibility of destroying an average convoy would probably not warrant the risking of so valuable a force. Such a raid also would have to be perfectly timed as it would be too dangerous to leave the raiders cruising about in an exposed position indefinitely. The necessary advance information would not be easy to get.

If, however, such a raid were made with an overwhelming force and perfectly timed, the planes of the escort would usually insure that the raiding force would be detected while still at a considerable distance. The convoy could be turned away at full speed and the commander in chief notified of the raid. If the distance of the raiders, when discovered, was great enough to prevent their overtaking the convoy before nightfall, fear of forces sent out by our commander in chief would probably compel the raiding force to abandon the pursuit due to the likelihood of being cut off from their base. Even if the raiders were so close, when discovered, that they could overhaul their prey before dark, the escort should be able to delay the raiding force long enough to enable the convoy to scatter and could probably damage the raiders enough to slow them down so that they could easily be cut off by surface vessels sent out from the fleet base. Even if, by some mishap, our surface vessels did not cut them off, the fleet air force would probably be able to overtake them and inflict enough damage to more than square the account. Thus, the raiding of our convoys would not be a tempting operation.

Unquestionably a battleship would afford more protection to a convoy than our proposed battleship type of 10,000-ton cruiser; but, if at war with a great naval power, we could not afford to disperse our capital ships for the protection of convoys. For that we must depend upon vessels of 10,000 tons or less. In other words, would our proposed 21-25 knot cruiser afford more protection to a convoy than one of 32-36 knots? This must certainly be answered in the affirmative. The one possible advantage possessed by the faster cruiser would be the ability to run away from an attack made by superior forces, and it could not do even that, if the raiding force included an aircraft carrier.

That there are hazards connected with the convoy system is undeniable. This might lead us to believe that it would be better to abandon it and simply have hunting squadrons patrolling the principal exposed trade routes. We are prone, however, to forget the unusual circumstances under which the late war was fought, particularly the handicap under which the German raiders operated.

Imagine the situation if we were at war with one of the leading naval powers: ten to twenty *Emdens* preying on our commerce; thirty or more disguised raiders of the *Möewe* type also at large; each of these raiders provided with scouting planes to assist in locating prizes; and each of them equipped with Diesel cruising engines which

would give them an enormous operating radius. Finally, imagine that each of these had unhampered access to its base, which the *Emden* and the *Möewe* did not have. Also bear in mind that, in the late war, the Allies had an enormous preponderance in cruisers that we could never hope to enjoy. Then recall the damage done by the few badly handicapped German raiders at large in the early days of the war, as well as the fact that nearly one hundred vessels were employed in running them down, and one must agree that, with all its hazards, the convoy system is the soundest method yet devised for the protection of commerce in the critical area. It provides absolute security from lone raiders and affords us the opportunity of cutting off and destroying important enemy vessels if he attempts a raid in force.

In a war with a great power, when our capital ships must be kept concentrated, this battleship type of cruiser would also be very effective for hunting raiders. Accompanied by an aircraft carrier and four large destroyers, it would constitute an invincible hunting squadron; just as the battleship-carrier-destroyer combination would be invincible for hunting capital ships employed as raiders.

For combined operations, our proposed slow, heavily armed cruiser would be simply invaluable. Its shallow draft would permit it to go close inshore where its powerful battery would enable it to give excellent covering fire for landing troops. Its stout protection would give it immunity to all mobile artillery, other than railroad artillery. The protection afforded all gun crews by having the guns housed in turrets would be especially appreciated when anchored close inshore. The battery of small automatic guns mounted in turrets would be very effective against machine-gun nests or exposed troops as well as against aircraft or motor torpedo boats. The 5-inch battery could be used for counter-battery work, or against exposed troops, machine-gun nests, or aircraft. The 8-inch battery could be used against the larger guns, for long-range work, and, if necessary, against aircraft. It is perhaps unnecessary to add that, in this class of operations where the ships must anchor for effective firing, high speed is absolutely useless; whereas the gun power and protection that can be obtained by reducing speed are simply invaluable. Speed is undeniably essential for certain cruiser functions; but building fast cruisers for the execution of those functions which do not require high speed is like purchasing caviar when one is in desperate need of bread and milk.

We advocate, then, a battleship type of cruiser having 10,000-tons displacement, ample protection against 8-inch shells, nine to twelve 8-inch guns with the same number of 5-inch guns and a strong battery of automatic guns, all mounted in turrets, two triple torpedo tubes, the usual aviation equipment, and a speed of from 21-25 knots. This would be especially designed for those defensive functions previously mentioned. For these, or for combined operations, it would actually be more effective than the *Ersatz Preussen* for the reasons previously given. In view of the furore created by this German armored cruiser, why should we hesitate to build one of the same general type, but which better meets our requirements?

The foregoing must not be misunderstood as a criticism of the remarkable design produced by the Germans. They are faced with a situation which differs fundamentally from ours and which is admirably met by their latest creation, the *Ersatz Preussen*.

THE AIRCRAFT CARRIER TYPE

In the PROCEEDINGS for September, 1928, Lieutenant Commander B. G. Leighton wrote:

> One may with profit give serious study to the suggestion that at least a considerable portion of the total tonnage which our present program contemplates for 8-inch gun cruisers be devoted to cruisers of the same displacement having armament comprising light bombing aircraft instead of 8-inch guns; these aircraft carrying cruisers to be employed on exactly the same mission as, and in coördinated action with, the 8-inch gun cruisers.

If one carefully reviews the various offensive functions of cruisers, it will seem that they all can be more effectively discharged by these carriers than by fast cruisers, *in such weather as permits flying*. The problem is to what extent carriers can replace the cruisers in view of the limitations imposed upon planes by the weather. However, as will be seen in the concluding section, this is one question whose answer can be postponed for several years.

There is even one defensive cruiser function in which these carriers would be valu-

able, the protection of convoys. Here, however, is an ideal field of usefulness for merchant vessels large enough to be converted to carriers but too slow for fleet use. Hence we may say that the 10,000-ton aircraft carriers will displace the battle cruiser type rather than the battleship type of cruiser.

There is one point of interest here in connection with the London conference. Other powers have expressed their willingness to let us have as many 10,000-ton cruisers, within the total tonnage limit, as we want, provided that they carry no guns larger than six inches. It is the 8-inch gun, 10,000-ton combination in which they wish to restrict us. Now, according to the Washington treaty, any aircraft carrier of 10,000 tons or less is classified as a cruiser, and may be built out of cruiser tonnage. If these proposed 10,000-ton carriers mounted no gun larger than six inches, and they probably would carry no gun larger than five inches, they also would come within the class in which other powers do not seek to restrict us. Suppose that, after the total number of 8-inch gun cruisers that we may build is agreed upon at London, we insert a clause permitting us to utilize the remainder of our cruiser tonnage in building 10,000-ton cruisers mounting no gun larger than six inches. Then when our *Omahas* become due for replacement, we could build seven 10,000-ton aircraft carriers which would be of the greatest value, instead of eleven or twelve small cruisers whose utility, for our purposes, would be very limited.

The Destroyer Type

The *Yubari* and *Chacal* represent this class. As was inevitable with the increase in cruiser displacements, it was realized that there were some cruiser functions which did not require the maximum in size and fighting power and for which the requisite numbers could consequently be obtained at much less expense by reducing the displacement. The Japanese solved this problem by building a small cruiser, while the French have gone in for large destroyers. The latter appears to be the soundest solution, for they meet the cruiser requirements and are at the same time excellent all-weather destroyers with unprecedented cruising radius for this type. Since they are primarily torpedo craft rather than cruisers, they do not come within the scope of this paper and will not be further discussed, except to call attention to the fact that these cruiser functions would otherwise be executed by the battle cruiser type of cruiser, the utility of which is correspondingly reduced.

The Submarine Type

The submarine cruiser has definitely been adopted by the leading navies. It takes care of such cruiser functions as observation off enemy ports, scouting ahead of the fleet, and commerce destruction in hostile waters where we dare not send surface raiders. Since it is primarily a submarine, we will not discuss it. The type is mentioned merely to call attention to the cruiser functions which it performs, and to the fact that they were formerly executed by the high-speed cruiser, whose field of usefulness is correspondingly diminished.

Fleet Flagship

The desirability of constructing a special fleet flagship was ably set forth by Captain Taussig in the Proceedings for August, 1922. While such a vessel is not primarily a cruiser, it must be built out of cruiser tonnage; for nobody would advocate using one of our capital ships for this sole purpose, and it is obviously out of the question to quarter the commander in chief and his staff on a destroyer. Hence, we must consider such a vessel in any discussion of the cruiser problem.

It is not the intention to repeat here the convincing arguments employed by Captain Taussig; but we do propose to call attention to certain subsequent developments which have added greatly to the strength of his contention that: "Such a ship would be worth more to the Navy and the nation than any single unit which the limitation of armament agreement permits us to build."

One of the principal changes is that the increase in probable battle ranges and the likelihood of more frequent employment of smoke screens mean that the commander in chief must rely less upon personal observation and more upon radio reports than he did in the past. In other words, it is of much greater importance for him to have uninterrupted radio communication than it is for him to be in the battle line. That he could not expect to have uninterrupted radio communication in a closely fought battle if he remained in the line is indicated by the

experience of the ships more hotly engaged at Jutland.

The reports of that engagement also indicated that he would probably have much better personal observation if he were out of the battle line. When the ships became closely engaged, the splashes of hostile shells falling short almost obscured the enemy. If the commander in chief were a thousand yards or so on the unengaged bow of the leading battleship he would have not only a better view of the opposing line but also of his own command. The latter is fully as important as the former and is a view which he would not have if he were in the line itself. Whatever position he took, it could quickly be changed if it proved unsatisfactory.

The crying need of both Jellicoe and Scheer at Jutland was information. Most of the time, both commanders in chief had only a vague idea of what was going on. With the ever-growing multiplicity of weapons and consequent complication of fleet tactics, the need for intelligent and constant coördination of all arms is greater than ever. How can any commander in chief properly exercise his functions aboard a vessel in the battle line from which he and his staff would have very limited personal observation and from which they could not depend upon having continuous radio communication after the battle became general? In other words, the flow of information and orders would be most likely to be interrupted, just at the time when both were most needed.

Still another factor is the terrific strain and resulting exhaustion, both physical and mental, of being aboard a vessel which is firing and being fired upon for the probable duration of a naval battle. Anything which will reduce this exhaustion is bound to increase the efficiency of the high command. The mental machine of any human being, furthermore, will function better if somewhat removed from the distracting din of gunfire, the nerve-shattering impact of heavy shells, and the heart-rending cries of wounded men. Not only will this special flagship use its battery only occasionally, due to its ordinarily engaging only aircraft, but also, its freedom of movement with respect to other vessels, and its superiority in speed permitting it to zigzag widely, will keep it from being a tempting target for either guns, bombs, or torpedoes. If we believe in the value of intelligent leadership, should we not give the commander in chief and his staff every aid to increased mental efficiency in battle?

The advent of the observation plane has also affected the situation. In any future naval battle it will be a priceless advantage to the commander in chief if he can send trusted officers of his own staff up in planes to get specific information and report in person. It is not unlikely that he will want to keep one or more officers of his staff in the air throughout the battle. Obviously, flying operations could not be conducted by a ship fighting in the line. Of course, carriers could send planes aloft at the admiral's order, but the vital element of personal contact would be lacking. This might suggest that one of the large aircraft carriers be used for the flagship, until we recall that the tactical employment of these vessels would almost preclude any personal observation by the commander in chief. In other words, so far as what the admiral could see is concerned, he might almost as well be ashore as on a carrier, if the carrier proceeded uninterruptedly with flying operations.

The logical conclusion is that we should build a 10,000-ton aircraft carrier as flagship. Until the surface forces were in contact, it would make very little difference to the admiral where he was, and his flagship would be free to function uninterruptedly as a carrier during the crucial phase of the air battle. By the time that was over, there would probably have been enough casualties among the planes, so that the surviving combat planes attached to the flagship could be transferred to other carriers, leaving only such planes as would be needed for the use of the commander in chief and his staff. His flagship would then be free to function exclusively as such during the time that it would be necessary for him to have absolute freedom of movement.

We must bear in mind that some future commander in chief might be of the old school of thought and insist upon a place in the battle line. In that event, this flagship could be used exclusively as an aircraft carrier. In no case would this be a 10,000-ton ship which could not be utilized to great advantage.

If we believe that such a vessel should be built, what about its characteristics? Its

displacement should, of course, be 10,000 tons. In order to give the commander in chief the necessary freedom of movement, its speed should be approximately 60 per cent above that of the fleet as a whole, or between 24 and 29 knots, depending upon what should be selected for the future battle speed of the fleet. Since it would always be screened by more powerful vessels, the usual main battery of 8-inch guns would not be needed on this ship, regardless of whether this was used as a flagship or an aircraft carrier. It should, however, have an unusually powerful battery of antiaircraft guns, both 5-inch and 37-mm. Since this vessel would always operate behind a powerful screen, the possibility of short-range contacts need not worry us, and the usual armor belt might be omitted. It should, nevertheless, have a curved protective deck, proof against medium-sized shells or bombs.

With its 10,000 tons displacement and no gun larger than five, or at most, six inches, it would come within the proposed nonrestricted class at London. Its construction, therefore, would not reduce the number of 8-inch gun cruisers that we may build.

The planes carried aboard this vessel would add to the offensive strength of the fleet; the powerful antiaircraft battery mounted by it would add to the defensive strength of the fleet; and the increased battle effectiveness of the high command made possible by such a flagship would add immeasurably to our chances of victory. On these grounds, we maintain that a specially constructed flagship should be included in the current cruiser-building program.

The Cruiser Situation in the U. S. Navy

It might be well, first of all, to review the points brought out in our study.

(1) The type of 10,000-ton cruiser now so extensively constructed is merely a slightly enlarged and improved *Raleigh*. The latter was built as a destroyer of a smaller and weaker cruiser and hence is a poorly balanced design when it comes to fighting ships of its own class. These unbalanced vessels must inevitably be succeeded by a better balanced design. A battle cruiser type, therefore, is proposed in which the number of guns in the main battery is reduced to six and the speed is reduced to between 28 and 30 knots in order to obtain the necessary protection, and the additions to the defensive armament required to meet modern conditions.

(2) Since cruisers are essentially fighting ships; since the degree of striking and resisting power which we can obtain on a fixed maximum displacement is dependent upon the extent to which we can cut the speed; and since there are many cruiser functions which do not require high speed, it is logical to build a slower type of 21-25 knots with the additional armament made possible by this reduction.

(3) Other cruiser functions may be performed by enlarged destroyers, by cruiser submarines, or by planes operating from carriers, none of which are purely cruiser types. Consequently, they are not discussed, except to call attention to the fact that their functions were formerly executed by the battle cruiser type of cruiser. The usefulness of the latter is therefore greatly reduced.

(4) A clause might be inserted in any agreement reached at London, which would permit us to build 10,000-ton aircraft carriers without reducing our allowed number of 8-inch gun cruisers.

(5) A specially constructed fleet flagship is an absolute necessity for effective leadership in battle.

The question then arises, what are the needs of the U.. S. Navy for these various types? We have ten *Omahas* built, ten fast 10,000-tonners under construction, and thirteen 10,000-tonners authorized but not laid down, besides seven cruiser submarines built, building, and authorized. We have no cruisers of the battleship, aircraft carrier, or destroyer types. The latter can wait until we replace our present destroyers. While the value of the aircraft carrier type is undeniably great, it is useless to build any of them until we have provided enough cruisers of the battleship type to defend the larger carriers already completed or authorized. Obviously then, our greatest need is for the latter class of cruisers and for a specially constructed fleet flagship.

An Experiment *in* Indoctrination

By Lieutenant Commander F. K. Elder, *U. S. Navy*

DURING at least one period of the modern U. S. Navy there was much talk of indoctrination. In this period Captain Sims evolved and used with startling success a doctrine in the destroyer flotilla. The commanding and other officers were taught this doctrine while in port and then used it very successfully at sea in the war games. If this method was so successful in training officers in the flotilla, no doubt it could be used to obtain good results in the solution of other problems.

Consulting Webster we find that indoctrination is defined as the act of indoctrinating. To indoctrinate is to instruct in doctrine or principles in general—to instruct—to teach. It has been said that to really learn a subject one should teach it.

With the above in mind it was decided to try to apply the method to the problem of the first lieutenant in keeping the ship clean and in a good state of upkeep. The application of such a formidable-sounding method to so simple a task seemed almost in the light of using a method requiring more work than the task to be accomplished.

However, the attempt was made. The first lieutenant undertook to indoctrinate all his men with the captain's policy as to care and upkeep of the ship. "Doctrine" and "indoctrination" were such heavy words that they were not mentioned to the petty officers or men at all. Apparently what they did not know did not hurt them.

Accordingly, the first lieutenant made up a list of all the common faults that were noticed on the commanding officer's weekly inspection. These he sorted and classified until they were reduced to five general defects. Then he made out a list of the five general principles which he believed would eliminate all the defects. In his daily inspections therafter he merely pointed out to the petty officer concerned the rule that had not been followed. The rules were simple.

Rule 1. There is a place for everything; keep everything in its place.

Rule 2. Start your cleaning in the corners; at inspection dirt piled neatly in the gangway will not be noticed.

Rule 3. Scrub paintwork daily with fresh water whether it needs it or not.

Rule 4. Chip off old paint where absolutely necessary and never chip off more than can be replaced with red lead after wire brushing the same day.

Rule 5. "By their boats ye shall know them." A smart ship has clean boats *that run.*

The first lieutenant explained each rule with exactness to each of his leading petty officers. Then he required each petty officer to explain them to all of his own men. The petty officers were required to know the rules and to call off the one that had not been followed when the first lieutenant pointed out a defect during inspection.

The results obtained were excellent. The petty officers fell quickly into the spirit of it and made it an enjoyable game. It outlined a definite policy they were to follow in very general terms and permitted them that play of initiative that breeds excellent and reliable petty officers. The men followed the lead of the petty officers and the improvement continued steadily. It had the drawback of having the men draw odious comparisons occasionally when alongside other ships that used a less effective method.

The results that came make one believe that such a method could be used in solving many other more difficult problems. In fact it is used in many, many ways and is given no name throughout the naval service. The scheme is old and has many times demonstrated its worth. It has the advantage of making the user of it know his subject with thoroughness, rather than think he knows it, in order that he may teach it to those who are going to do the actual work.

The effect of the experiment was twofold. It improved the ship. It improved the crew by making it more observant and more proficient. Last but not least, it gave an excellent demonstration of the simplicity and effectiveness of that formidable-sounding term "indoctrination."

Selection *a la* Race-Track Method

By COMMANDER J. S. McCAIN, *U. S. Navy*

WELL, demmit, why not? Every other method has been proposed and discussed, both the sublime and the ridiculous, from ascension contrived by the Angel Gabriel—and he would be irreverently taken to task—to brimstone seizure out and down by the Prince of Darkness —who would receive a sacrilegious meed of praise.

Between the two great sports there are striking resemblances; wind, speed, stamina, and luck all count. Many place an emphasis on wind. All the impulses of human nature have full play in each game. Consider the number of forces that pull and tug at a captain in making out a fitness report, likewise all the various ways by which we underlings strive to beguile him into writing nice footnotes about us. Compare the foregoing with the training, scheming, planning, plotting, and running on the race tracks. How alike, too, in results. Favorites often falter in the last few strides, while long shots drop from the clouds to win. Old "has-beens," warmed by the June suns, recover the use of dinky legs and stage stirring comebacks.

True, the introduction of this method would necessarily induce a language study of the racing idiom by those who have not previously taken and paid for the course. Also, it would require an amount of figuring, compiling, preparation of form charts, etc.

But the Titian-haired priestess of the red-backed, yellow shrines of the fitness reports could enforce a sufficient recess from recurrent receptions to put the clerical work through. Doubtless, too, she could find the time, as well as the inclination, to peddle stable tips, hand out predictions and charts, pick long shots, and run a handbook.

In this analogy the officers of the general list seeking promotion would furnish the widely differing specimens of the genus Eohippus. Each reporting senior becomes a race track, please pardon. An average of performances on all tracks would give a mean to which individual performances might be referred as to a common standard. Thus the average marks for all commanders becomes the median line for that group. The average of marks assigned to commanders by any one senior would be higher, the same, or lower than the common standard. If higher, this particular reporting senior is a fast track; if lower, he is a slow track. The difference becomes his track variant, plus or minus as the case may be.

For instance, if the average mark of all commanders is 3.6 (that is not far from it), and the average mark assigned by Captain A to commanders who serve under him is 3.8, then his track variant is –.2 which must be applied to any individual mark assigned by him to reduce that mark to the common measure. His pet commander's cold 4.0 would become a more reasonable 3.8.

Naturally track conditions would be taken into the dope account—surreptitiously by the whispering tipsters. A sloppy track or a fast track would depend, perhaps, on rotten coffee or good coffee, digestion or indigestion, a cross or a complacent spouse. Unfavorable track conditions could be ingeniously concealed, yet made public.

The Selection Board, that august body, would be put in the position of being dopesters as well as judges. Their duty would be not the judging of an actual race, but the picking from past performances of the best handicap animals in training, generally found in custom from the upper tenth of each rank. Their work would be similar in operative detail though far different in result, to the choosing of fictitious All-American elevens by football experts.

A study of the form charts would yield much curious as well as valuable information. Running Commander X's line through Captains A, B, and C would disclose many interesting angles on Commander X, as it most assuredly would on Captains A, B, and C. If six months is considered six furlongs

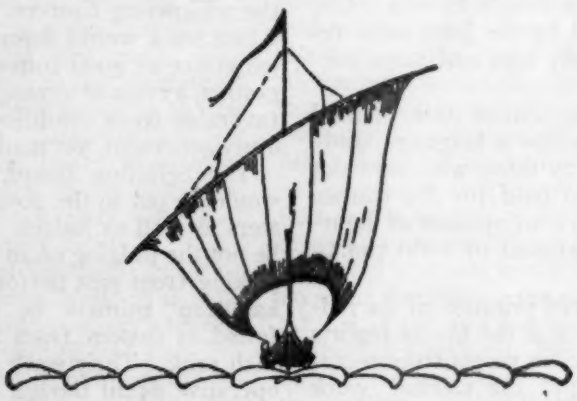
and one year one mile, disproportionate to be sure, but not out of harmony with the article, sprinting and distance animals may be distinguished. If on first report an officer is a world beater and thereafter tapers off it would look as though he were a quarter horse. On the contrary those who pick up as time goes on should be rated as distance animals.

Inferences of all kinds could be drawn. Thus, Captain A's marks on Commanders X and Y, Captain B's marks on Commanders Y and Z, and Captain C's marks on Commanders X and Z would give an equation from which Captain B's rating of Commander X could be deduced. That is, Commander X's performance in competition with Y and Z on tracks A and C would predict his performance on track B.

Handicaps would be as variable as they are in actual racing. Weight for age or for service eliminates some entries. Then there is the evident burden of a preponderant propensity prejudicial to prohibition, also fractiousness at the post and on the track, dull boy in the pilot house, etc. Identic with racing, there is always the chance of slipping with the foot, particularly on sloppy tracks. If a fall results, innocent animals may pile up or lose distance. There is a similar jockeying for the start, i.e., the job. The dear old Bureau of Navigation is the much abused starter.

Remember that the dignified and respected judges must also dope from the form charts. And even on their eminence it could hardly be hoped that they would escape those influences that commonly affect the most hardened as well as the most upright of race-track habitues. The nuances of touts and tipsters and red-hot dope from the stable would float up, faintly perhaps but nevertheless surely, to the remote heights of the judges' stand. Recorded form charts would no doubt suffer some modification.

Would this scheme work? Yes, just once. Then old man human nature would get busy. Some kindly but unscrupulous skipper would give his favorite pony a 4.5, thus securing a victory once. The other skippers would sigh, but in justice to their subordinates, follow suit.



By Ewing Galloway, N.Y.

A GOLDEN GATE SUNSET

Looking westward through Golden Gate, Calif., past Land's End lighthouse, which stands on a rock just off the south shore.

Courtesy Bureau of Aëronautics, Navy Department

PEARL HARBOR, T.H.

Well-formed cumulo-nimbus at sea in lower right half of picture, showing anvil top of false cirrus. Cumulus clouds in upper right side of photograph. Patches of alto-cumulus in middle left.

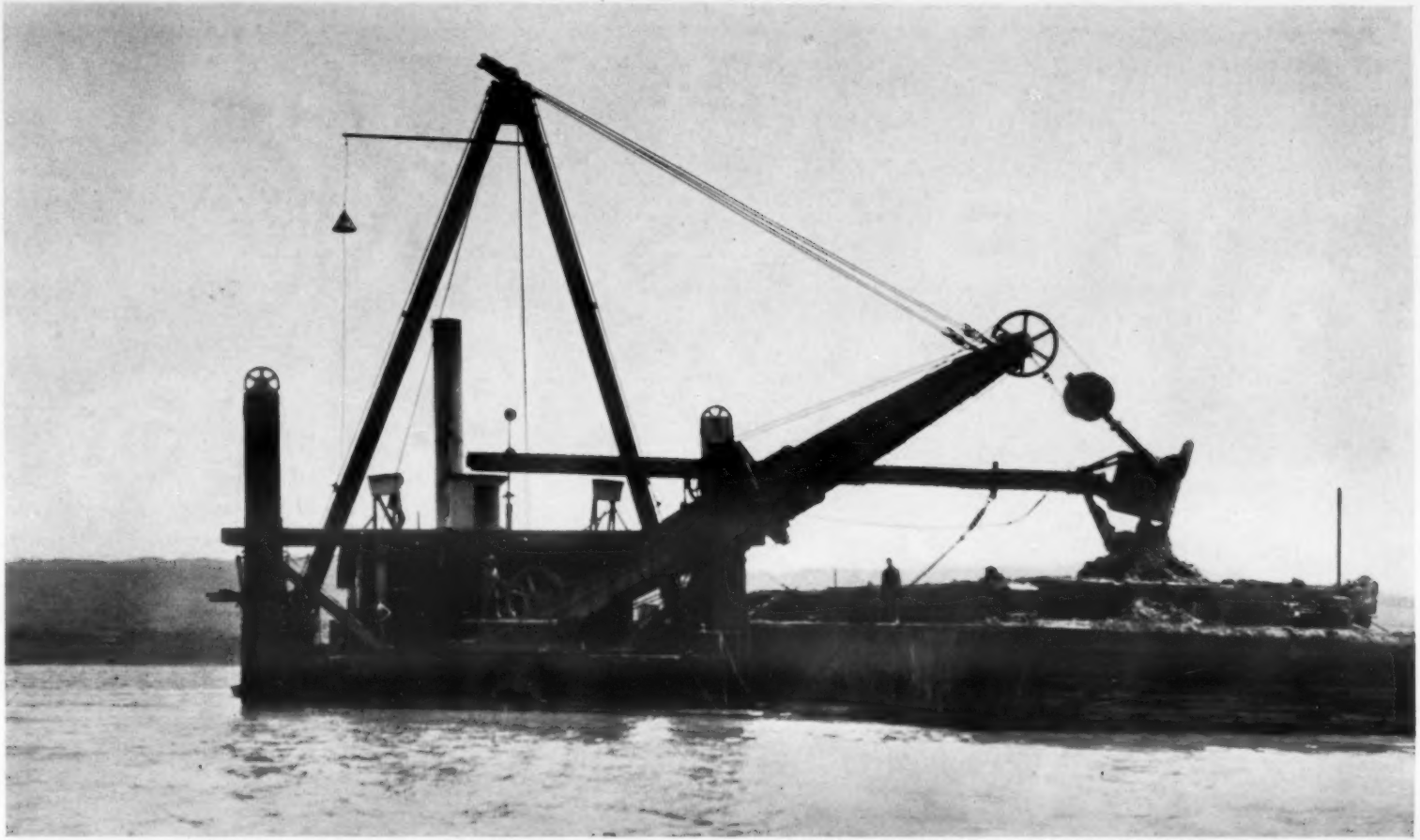
Well-formed cumulo-nimbus at sea in lower right half of picture, showing anvil top of false cirrus. Cumulus clouds in upper right side of photograph. Patches of alto-cumulus in middle left.

Courtesy Bureau of Aëronautics, Navy Department

PEARL HARBOR, T.H.

Row of cumulus clouds formed by deflection upward of the trade winds from beyond the mountains, over the Koolan Range, Oahu. These resemble strato-cumulus and would be called strato-cumulus if the patch extended over any large portion of the sky. Wisps of cirrus above the cumulus.

UNIV. OF MICH.

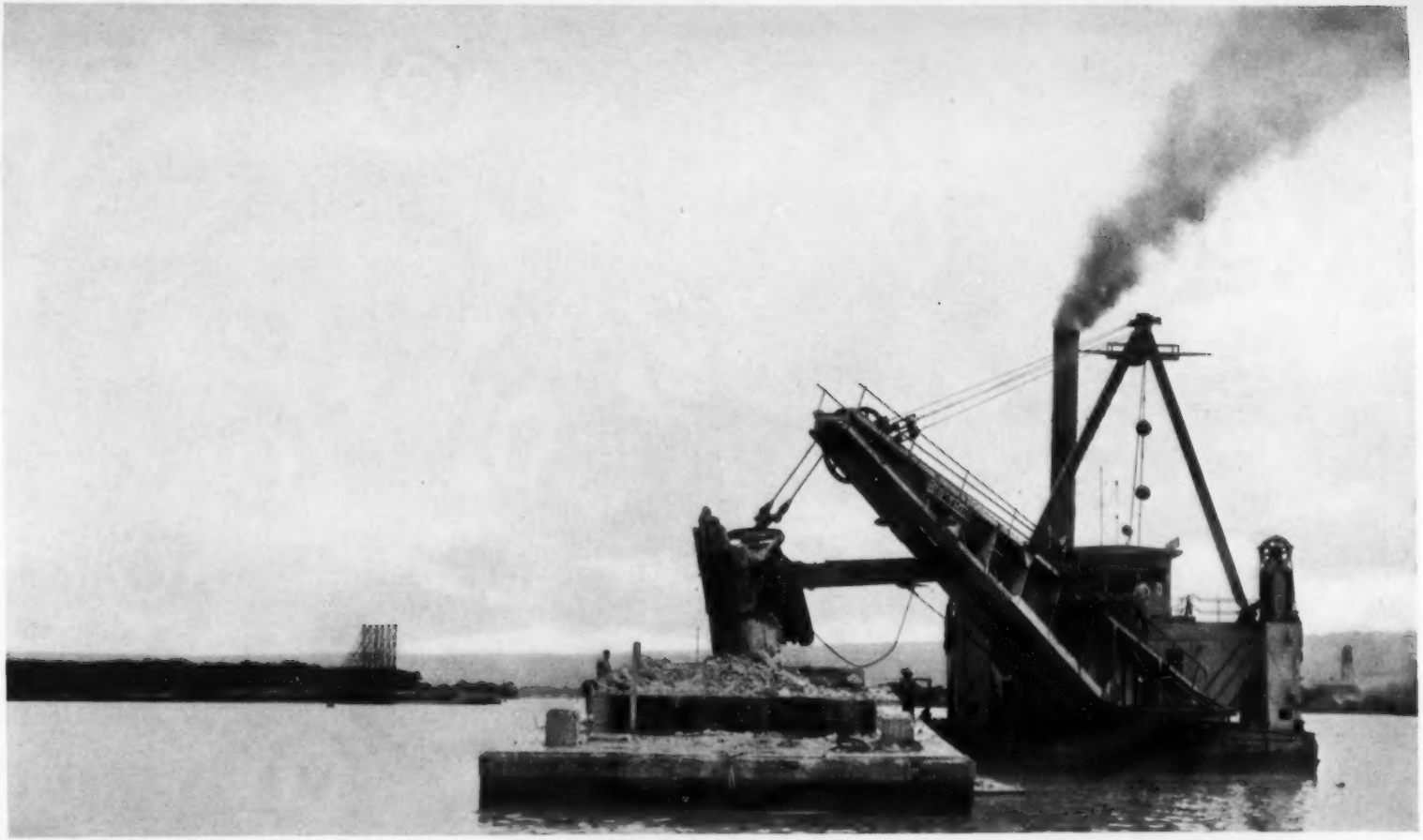


Courtesy Mr. Walter F. Dillingham

FOUR-YARD DIPPER DREDGE *G. P. DENISON*

(See page 403)

(See page 403)



Courtesy Mr. Walter F. Dillingham

DIPPER DREDGE *R. W. ATKINSON*
This dredge has a capacity of eight yards. (See page 403)

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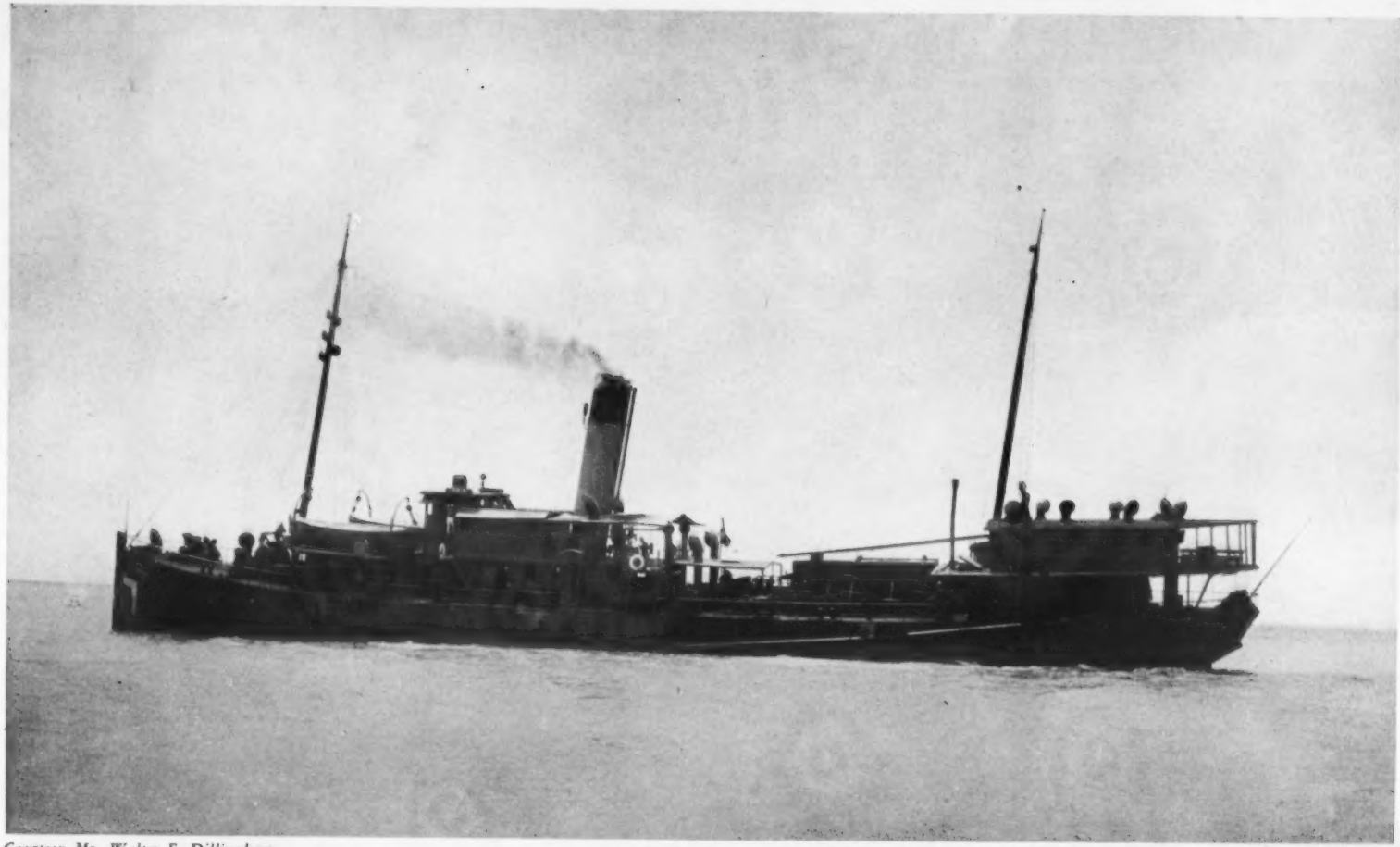
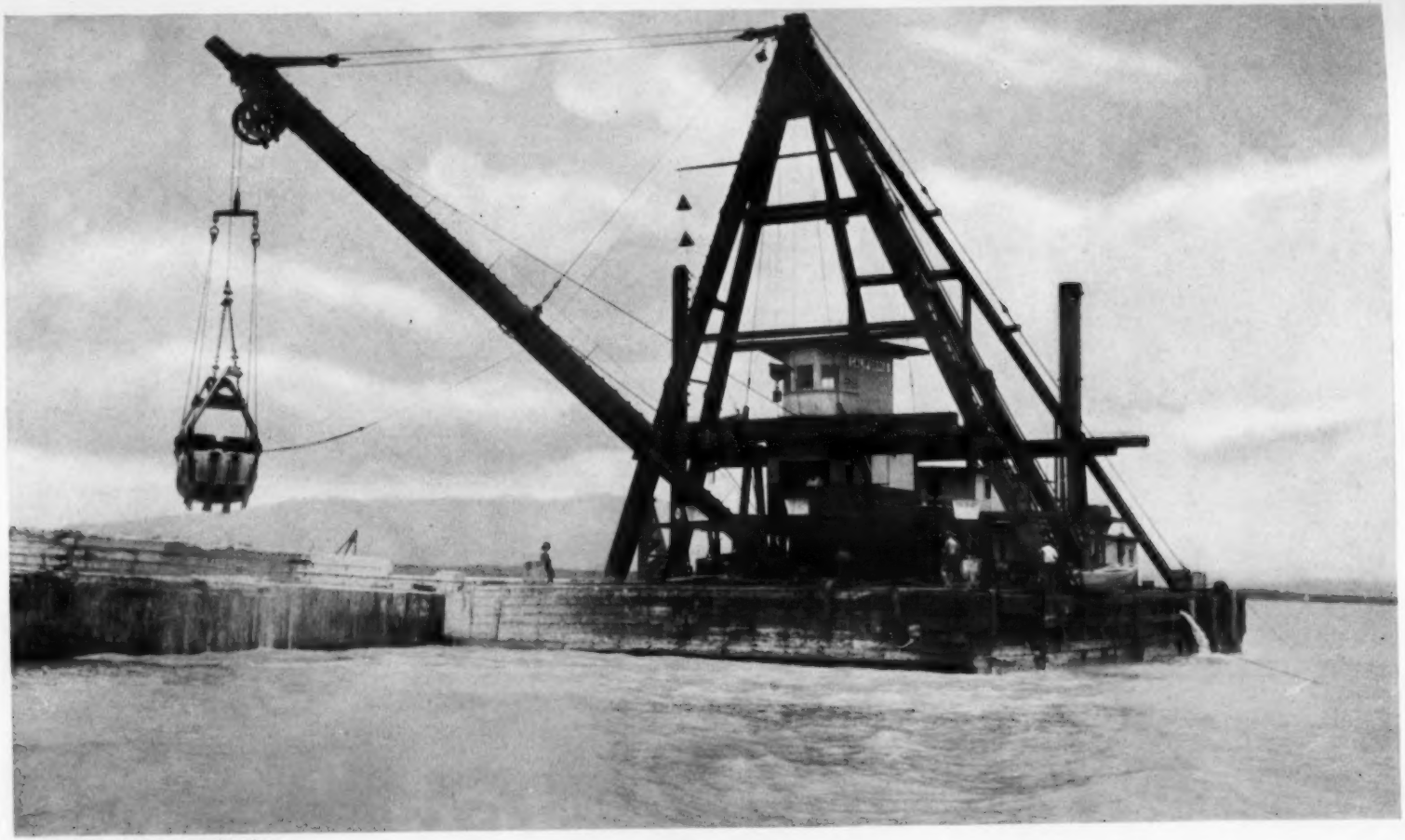


Courtesy Mr. Walter F. Dillingham

SEAGOING HOPPER DREDGE *CAUCUS*
(See page 403)

(See page 403)



Courtesy Mr. Walter F. Dillingham

CLAM-SHELL DREDGE *CALIFORNIA*

The capacity of this dredge is four and one-half yards. (See page 403)

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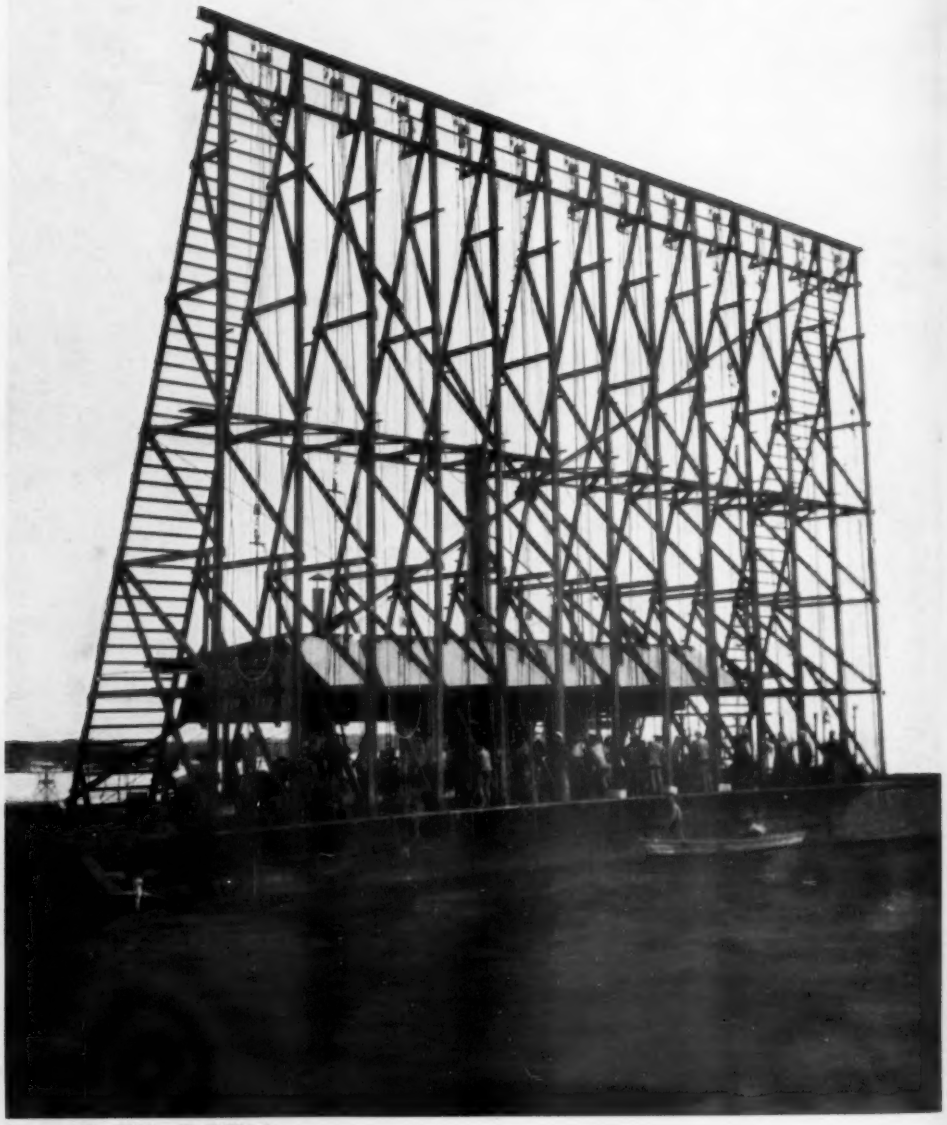


Courtesy Mr. Walter F. Dillingham

TWELVE-GANG FLOATING DRILL SCOW

(See page 403)

Pearl Harbor

By WALTER F. DILLINGHAM

(Read before Social Science Club, Honolulu)

PEARL HARBOR, as it is now known, is mentioned in the accounts of early Pacific voyages as "Wai Momi"—literally, the "Water of the Pearl," or "Pearl Water." We find it also mentioned in early accounts as "Pearl River," and "Pearl Lochs."

The earliest discoverers, explorers, and traders, who wrote accounts of their visits to the Sandwich Islands, seem to have given most of their attention to the islands of Hawaii, Maui, and Kauai. The first published description of Pearl Harbor appears to be the one mentioned in Captain Nathaniel Portlock's journal, printed in 1789, of his experiences on a voyage of discovery in command of the British vessels *King George* and *Queen Charlotte*. He records the fact that his mate, Mr. Haywood, on June 3, 1786, "landed in the West part of George's Bay [which is understood to mean the water within the crescent-shaped shore line extending from Barber's Point to Diamond Head, which Captain Portlock called "Point Dick" and "Point Rose"] and walked up to a rising ground from which he could perceive the land around the West point of King George's Bay to fall in and form a fine, deep bay running well to the northward and the westernmost land stretching out to the southward."

From 1786 until the publication in 1845 of the record of Commodore Wilkes' visit with the United States Exploring Expedition, there is only casual mention of Pearl Harbor by those who left accounts of their visits to the islands. Captain George Vancouver, reporting on the visit which he made on H.M.S. *Discovery* between 1792 and 1794, records the fact that he started to make a survey of "Oporoah," as he called Pearl Harbor, but, on finding that the entrance was navigable only for small craft, the survey was discontinued.

Captain John Kendrick, in command of the *Lady Washington*, an armed merchantman operating before the founding of the American Navy, is reported to have assisted the King of Oahu in a victorious battle in the Pearl Harbor region late in 1794, operating with his crew both ashore and from small boats in the lagoon. This might properly be called America's first military activity in Pearl Harbor.

Captain Archibald Campbell, in his *A Voyage Around the World from 1806 to 1812*, gives quite an accurate description of a reconnaissance of the shore line and waters of Pearl Harbor, which he called "Wymumme," with the description of Ford Island which was then known as Rabbit Island.

In the *London Literary Gazette* of 1821 there appeared a series of articles by Peter Corney, one of the earliest white settlers of Oahu, who reports a visit to "Wy Momi" in 1818. This report is more specific than any of the previous ones in regard to the depth of water, which he said was "not more than fifteen feet of water on the bar or reef at high water and inside from six to eighteen fathoms mud and sand." Corney also stated that there were "many divers employed here diving for pearl oysters which are found in great plenty. We saved them much trouble and labor by presenting the king with an oyster dredge we had on board and with which Tameameah was highly delighted." So far as can be ascertained, this is the first use of a dredge in these islands.

Gilbert Farquhar Mathison, in his *Narrative of a Visit to Brazil, Chile, Peru and the Sandwich Islands During the Years 1821 and 1822*, which was published in London in 1825, reports having made a trip to Pearl Harbor by land on July 19, 1822, but adds nothing of importance to the previous descriptions of that harbor.

In 1824, Great Britain, in sympathetic courtesy, sent the bodies of Kamehameha II and his Queen, who had died in London of the measles, back to Hawaii on the man-

of-war *Blonde* under the command of Lord Byron. The British government took advantage of this opportunity to acquire more detailed information concerning the islands; and, to that end, included in the personnel of the ship a party of scientists. Among these was a young lieutenant of the Royal Navy, Charles R. Malden, who appears in the record as a surveyor. The *Blonde* arrived in Honolulu in 1825 and, during its stay, Lieutenant Malden made a comprehensive and extensive survey of several harbors and roadsteads. One of these surveys was a fairly complete charting of the whole of Pearl Harbor, with soundings taken throughout the entrance channel and the three main lochs. The chart resulting from this survey was printed in 1841 by the British Hydrographic Office and a copy of it is to be found in the Territorial Survey Office as registered map No. 437 under the title, "South Coast of Oahoo (Sandwich Islands), Surveyed by Lieut. C. R. Malden, R.N., 1825." This coast-line map shows the whole of Pearl Harbor and tributary country and indicates the existence of extensive fields of cultivation in its vicinity. What is known as the Shark Pen at the narrows in the inner entrance to the harbor is marked, "Fish Wear Point."

In connection with this same expedition, Andrew Bloxam, the naturalist among the scientists aboard the *Blonde*, reports that a party including himself, on May 17, 1825, went "in the launch on an expedition to the Pearl river or lochs," and, after describing the hazards of navigating the narrow entrance through the coral reefs, states that but for the treacherous approach "it would form a most excellent harbor as inside there is plenty of water to float the largest ship and room enough for the whole navy of England."

In 1840, fifteen years after the British survey had been made, but a year prior to the publications of the Malden chart, Commodore Charles Wilkes of the United States Exploring Expedition, under orders to chart the islands of the Pacific for the United States government, called at Oahu. During his visit, Kamehameha III requested him to make a survey of Pearl Harbor. The chart resulting from his work is on file in the Territorial Survey Office as registered map No. 421 under the title, "South side of the Island of Oahu, Hawaiian Islands, Showing the Harbours of Honolulu and Ewa or Pearl River." This chart represents the first technical work by the United States Navy in Pearl Harbor. It is interesting to note that this survey was limited to sounding across the bar and through the channel only as far as Bishop Point or just within the landlocked area. Some of the landmarks noted on this chart still stand, but the Hawaiian Dredging Company's camp at Watertown occupies the location marked as a "Poi Village."

In Volume IV of his narrative of the United States Exploring Expedition, which was published in Philadelphia in 1845, Commodore Wilkes, in referring to Pearl Harbor, states that "the inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits," and expresses the opinion that "if the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbor in the Pacific." It is interesting to note that Commodore Wilkes reports having visited a sugar mill in the district of Ewa which was producing "about 200 pounds of sugar a day during the season."

As a result of the gesture by Lord George Paulet to annex the islands to Great Britain in 1843, Dr. G. P. Judd, the Hawaiian minister of foreign affairs, took advantage of the presence of the U. S. frigate *Constitution* in Hawaiian waters in 1845 and requested Lieutenant I. W. Curtis, a young American marine officer, to survey the situation and make some recommendation as to the best practicable method of fortifying Honolulu against further foreign aggression. This investigation was made secretly and Lieutenant Curtis communicated his conclusions to Dr. Judd after the departure of the *Constitution*, in the form of a letter written from Mazatlan, Mexico, on February 21, 1846. After outlining his suggestions for the defense of Honolulu Harbor, Lieutenant Curtis goes on to say:

> If you will allow me, or if you will propose to our government to send on regular engineer officers from that corps, all the work might be going on at once, together with that of clearing out the reef both at Honolulu and Pearl Harbor. . . . . And I may call your attention to the vast importance of the harbor of Pearl Harbor. The perfect security of the harbor, the excellence of its water, the perfect ease with which it can be made one of the finest places in the islands, all combine to make it a great consideration.

For more than twenty-five years after this pertinent suggestion by this young American officer of the importance of Pearl Harbor as a factor in connection with the military defense of the islands, there is practically nothing with reference to the harbor to be found in the published records of the large number of American ships whose visits overlapped. This may possibly be accounted for by the fact that religious, social, and other internal troubles were occupying the minds not only of the residents, but of the visitors and explorers during that period. In 1873, the U. S. steamship *California* brought to the islands a military commission consisting of Major General J. M. Schofield and Brevet Brigadier General B. S. Alexander, a lieutenant colonel of engineers. This commission proceeded, under secret instructions from the Secretary of War, William W. Belknap, to examine the different ports of the Hawaiian Islands with reference to their defensive capabilities and their commercial facilities.

In its report to the Secretary of War, written to show the defensive possibilities of the different ports of the Sandwich Islands, the commission said:

> With one exception, there is no harbor on the islands that can be made to satisfy all the conditions necessary for a harbor of refuge in time of war. This is the harbor of Ewa or Pearl River situated on the Island of Oahu about seven miles west of Honolulu. Pearl River is a fine sheet of deep water extending inland about six miles from its mouth where it could be completely defended by shore batteries. The depth of water, after passing the bar, is ample for any vessel.

After a brief description of what we now call Ford Island, the report continues:

> From our examination, we are of the opinion that this island, Rabbit Island, and the adjacent shore to the North and West of it afford the most advantageous location for a naval depot of supplies and equipment in all these waters. But there is not sufficient water at present for heavy vessels to enter this Pearl River Harbor. At the entrance of the harbor is a coral reef some two hundred and fifty to three hundred yards in width with a depth of water of only two to three fathoms on the reef at low water. . . . .
>
> This coral, found at the entrance to Pearl River, is "dead." That is, it is not growing and the reef is therefore not increasing in size. This ridge of coral forms a barrier or bar across the entrance of this harbor. . . . . If this coral barrier were removed, Pearl River Harbor would seem to have all or nearly all the necessary properties to enable it to be converted into a good harbor of refuge. It could be completely defended by inexpensive batteries, on either or both shores, firing across a narrow channel of entrance. Its waters are deep enough for the largest vessels of war and its lochs, particularly around Rabbit Island, are spacious enough for a large number of vessels to ride at anchor in perfect security against all storms. Its shores are suitable for building proper establishments for sheltering the necessary supplies for a naval establishment such as magazines for ammunition, provisions, coal, spars, rigging, etc., while the island of Oahu, upon which it is situated, could furnish fresh provisions, meats, fruits, and vegetables in large quantities.

In answer to the hypothetical questions: "Can the coral reef at its entrance be removed? If so, at what cost?" the report goes on to say that the American admiral commanding the U.S.S. *Pennock*, which was then at Honolulu, had been requested to have a survey of the bar made; but that, pending receipt of this, Lieutenant Colonel Alexander had made soundings and a cursory examination and, "It is his opinion that an entrance could easily be cut through this coral reef by surface blasting and that the fine debris would be washed seaward under the influence of the currents while the larger masses could be removed by dredging or by divers. . . . ."

The report states the opinion of the commission "that the amount of coral to be removed to open a channel 200 yards in width with a depth of 26 feet of water at low tide would be about 250,000 cubic yards and that it could be removed for one dollar per cubic yard," adding that a channel opened through the reef would not fill up, as the channel to Honolulu Harbor, where conditions are similar, had remained open.

In summing up its report, the commission says, "It is to be observed that if the United States are ever to have a harbor of refuge and naval station in the Hawaiian Islands in the event of war, the harbor must be prepared in advance by the removal of the Pearl River bar. When war has begun, it will be too late to make this harbor available and there is no other suitable harbor on these islands." Following this examination, General Schofield arranged to have a survey party from the U.S.S. *Pennock*, then visiting in Hawaiian waters, make a complete survey of Pearl Harbor, in collaboration with the surveyor general of the kingdom, W. D. Alexander. This combined hydrographic and topographic survey was completed and printed in 1873 and a copy

of it is now on file in the Territorial Survey Office as registered map No. 448.

E. J. Carpenter, in his *America in Hawaii, A History of United States Influence in the Hawaiian Islands,* published in 1899, says:

> The report of this commission, which included the information that the mind of the king was favorably inclined toward a cession of Pearl Harbor in return for the advantages to be gained by the islands by a treaty of reciprocity, produced a profound impression upon the government at Washington. This was intensified by the subsequent appearance of General Schofield before a committee of the House of Representatives to urge the importance, chiefly from a military point of view, of the adoption of some measure through which the control of the islands might pass to the United States.

From articles and editorials appearing in the *Hawaiian Gazette* of 1873, it would seem that sentiment favorable to annexation to the United States was then more pronounced and more general than at any previous time and that the suggestion of the cession of Pearl Harbor to the United States was generally considered a preliminary move in that direction. King Lunalilo was petitioned by the Honolulu Chamber of Commerce in February, 1873, to negotiate a reciprocity treaty with the United States and in this resolution the suggestion was made that the Pearl River lagoon be offered to the United States as an inducement. After due consideration, the King conveyed to the United States minister at Honolulu, through his minister of foreign affairs, the original treaty proposal in which was included the cession of the Pearl River lagoon; and, on July 7, 1873, the American minister notified his government at Washington that the King had offered to negotiate a treaty on that basis. Four months later the *Hawaiian Gazette* of November 14, 1873, prints a "By Authority" notice to the effect that the King was satisfied that a treaty carrying with it the cession of Pearl Harbor would not receive the legislative approval required by the constitution of the kingdom and hence had withdrawn that feature of his offer. The editorial comment appearing in the *Hawaiian Gazette* of that date endeavors to explain that the original Pearl Harbor proposal had been for a lease and not a cession of territory. Much capital was made of the proposal to excite the Hawaiians to opposition.

After the death of Lunalilo and the election of Kalakaua as King, he proceeded to Washington and there, it is conceded by some writers of the time, it was the King's personality which was largely responsible for the final consummation of the original reciprocity treaty in 1875.

The financial benefits of this treaty to the agricultural interests of the islands were so great that the best interests in Hawaii were keenly alive to the importance of securing an extension of the treaty beyond its definite term of seven years. Due to opposition on the mainland, expressed in Congress and elsewhere, this extension was not secured for a number of years; but finally, on January 20, 1887, the United States Senate in secret session ratified the convention providing for the extension of the treaty, after adding an amendment as Clause II, providing that "His Majesty, the King of the Hawaiian Islands, grants to the Government of the United States the exclusive right to enter the harbor of Pearl River, in the Island of Oahu, and to establish and maintain there a coaling and repair station for the use of vessels of the United States, and to that end the United States may improve the entrance of said harbor and do all things needful to the purpose aforesaid." This treaty was ratified by the Hawaiian Senate and signed by the King on October 29, 1887.

It may be interesting to note that the Princess Liliuokalani, afterwards Queen, in her diary of September 26, 1887, noted that the King had on that date signed the final convention including a "lease of Pearl Harbor," as she called it; adding her opinion that "this was a mistake." It is also of interest to note that the treaty had scarcely been proclaimed when a note was handed to the Secretary of State in Washington by the British ambassador, in which the attention of the United States government was called to the Franco-English compact of 1843 by which those two nations agreed never to take possession of the Hawaiian Islands "either directly or under the title of a protectorate"; and suggesting a triple compact in which the United States should join, guaranteeing the neutrality and equal accessibility of the islands and their harbors to the ships of all nations without preference. The British commissioner at Honolulu simultaneously delivered a note of for-

mal protest against a grant to the United States of the exclusive use of Pearl Harbor as a coaling and repair station.

After conferences and exchange of letters, the British ambassador wrote the Secretary of State:

> Under instructions from Her Majesty's Government, I have already pointed out to the government of His Hawaiian Majesty that the acquisition by a foreign power of a harbor or preferential concession in the Hawaiian Islands would infallibly lead to the loss of the independence of the Islands."

While this treaty continued in force until August, 1898, no advantage was taken by the United States government of the opportunity to fortify or use Pearl Harbor as a naval base. The shallow entrance constituted a formidable barrier against the use of the deep protected waters of the inner harbor as definitely in the nineties as in the thirties. In 1894, a survey party from the U.S.S. *Philadelphia* conducted a survey, including borings in the outer channel, to secure further information as to the character of the material which would have to be removed, and in 1898 a similar survey was made by a party from the gunboat *Bennington*. The first appropriation of $50,000, sought in 1897, failed of passage by Congress and it was not until 1900 that an appropriation of $100,000 was made to dredge the channel.

Plans and specifications were prepared and bids called for by the United States district engineer at San Francisco for the excavation of a channel 200 feet wide and 3,085 feet long to a depth of 30 feet. In the call for bids, it was stated that only sand was to be removed. The firm of Clarke & Henry of Stockton, California, was awarded the contract at 44½ cents per cubic yard. An inadequate clamshell dredge and scows were built and equipped in Honolulu. After a year of unsuccessful effort, Clarke and Henry subcontracted the work to the Hawaiian Dredging Company which, in turn, subcontracted it to Cotton Brothers of Oakland, California, in September, 1902. Under the arrangement made, the Hawaiian Dredging Company was to render assistance by furnishing plant and men, if needed, to augment the equipment of Cotton Brothers, who planned to use a 16-inch suction dredge under charter from the Territorial government. The time spent in making ready this chartered dredge was so much longer than anticipated that the Hawaiian Dredging Company was called upon to put its plant in operation on the Pearl Harbor bar in order to comply with the conditions of the contract. The dredge was towed to Pearl Harbor and started operations on the bar. After it had been at work for a very limited time, the other chartered dredge was also towed down. On the night of its arrival, a Kona storm broke and, before it was possible to tow the shallow draft machines into shelter, the government dredge was torn loose from its moorings and sank almost in the middle of the channel. The Hawaiian Dredging Company's machine was broken adrift and carried onto the reef toward Queen Emma Point. The beaching of this machine saved her; and, after necessary repairs, she alone completed the work under the contract. The government dredge was purchased from the insurance company and the machinery salvaged by divers.

This channel, which represented a narrow cut through the sand bar between the shoulders of the coral reef, was only a preliminary. The coral points jutting out under water on the sides of the deeper channel between them made the inner channel so sharp that the navigation of anything but small craft was hazardous.

In December, 1901, the Navy, having adopted the report of the Barker Board, started condemnation proceedings for the site of the proposed naval station, involving some 676 acres of land on the east shore of the harbor, including all water, riparian, fishing, and other rights connected with it.

In 1908, a call was issued by the Navy for bids to dredge a channel which, when completed, would permit the use of the harbor by the largest ships of the Navy. The plans contemplated an entrance channel through the reef 600 feet in width with a minimum depth of 35 feet and included the cutting off of ten coral promontories which jutted into the channel as well as the removal of a long, narrow, submerged reef extending from Magazine Island out into the turning-basin area opposite the naval station. An estimate of the amount of material to be removed in this channel of more than five miles in length was made and the yardage fixed at approximately five million cubic yards. The contract, when awarded,

was for the completed channel, irrespective of the actual yardage removed and irrespective of the amount of material which might have to be removed from the side slopes of the cuts and in over-depth dredging.

This contract required that roughly one and one-half million yards be removed from the section exposed to the surf and swells of the reef. The drilling and blasting of rock under these conditions contained a most uncertain element of cost—particularly uncertain as there was no drilling equipment in existence which guaranteed the operation of a rotary drill in a seaway. The contract permitted the depositing of dredged materials within the harbor in the deep pockets found in the lochs, some of which were as deep as 125 feet. The time completion was fixed at three years.

Many engineering corporations sent representatives to the islands to study local conditions and prepare estimates of the cost of the work. Bids were opened in December, 1908, in Washington, and prices varied from three and one-half to five million dollars. The contract was awarded to the Hawaiian Dredging Company. Seven dredges were employed on the work, representing five different types of excavating machinery. Up to that date this contract represented the largest dredging project in the history of the Navy and, because of certain channel features, the most difficult one.

From the first, the problem of the undertaking was recognized to be the blasting and removal of the hard rock anticipated in the outer or sea sections of the work. While a sand-sucking rig and a clamshell dredge were exposing the solid formations there, every effort was made to develop a machine that would drill and blast the rock encountered. Over 200,000 cubic yards of sandstone were finally developed. During the time of the early operations, a very unique rig was invented. This contrivance was built at a nominal cost but proved the savior of the situation and, so far as is known, no better rig has since been devised. When it was found that the drill would work and that the hard section could be shot, it became necessary to have a tool which would rake in the broken rock resulting from the blasting operations. Investigation of various drag-line scraper rigs resulted in adapting a Chicago Drainage Canal land machine to a floating plant and a novel dredge was built which successfully and expeditiously removed the broken sandstone.

All machines were operated twenty-four hours a day, weather permitting, and the work was completed, surveyed, and accepted by the government and final payment made thirty days before the date set for completion of the contract.

Shortly after the start of this dredging contract, another contract was let for the construction of a dry dock 620 feet long. After the award of this contract to the San Francisco Bridge Company, the length of the proposed dock was increased to 831 feet and then to 1,039 feet; and, shortly after the formal execution of the contract, a subcontract was negotiated which turned over the undertaking to the Hawaiian Dredging Company. While grave doubts had been felt about the success of the dredging contract, it was anticipated that the construction of the dry dock would present no serious difficulties. Engineers experienced in dry-dock construction were employed and the work was laid out with every thought for the speedy erection and completion of the structure. The plan in the main was for a graving dock to cost approximately $3,200,000.

When the basin had been excavated, the concrete foundation of one of the five sections poured and the cofferdam erected for three of the sections, one section was pumped dry. Before the work of stopping leaks in the side of this section had progressed very far, and when fifty men were down in the cofferdam at work, the engineers detected what they at first thought to be a land subsidence but what immediately proved to be a rising of the unwatered section. The men were ordered to the surface and were off the structure in time to see this section, 150 by 200 feet and 50 feet deep, pushed 15 feet into the air by the upward pressure. At this point, the water crushed in the lower members of the cofferdam and rushed into the vortex under great pressure. In five minutes, several million feet of timber were broken into kindling wood, pumps, hoisting engines, concrete mixers, derricks, and locomotives were precipitated into the tangled mass of ruins and two years' work had been destroyed in less time than it takes to relate the catastrophe.

Immediately the question was raised as to the responsibility for and the cause of the accident. A difference of opinion arose among the government's engineers and it was finally decided by the then Secretary of the Navy to send America's most competent subaqueous authority, Mr. Alfred Noble, to investigate and determine the cause of the failure. His report was to the effect that the foundation conditions were not as assumed and were not suitable for the structure as designed. Since the responsibility for the design was on the government, it remained for an agreement to be reached between the government and the contractor for settling the costs incurred and negotiating for the construction of a dock under a new design. It was twenty-two months after the disaster and under an increased appropriation of one and one-half million dollars that work upon the new dock was started. The figures accepted were based on the aggregate of items of cost prepared by the government and the contractor in agreement, and called for the construction of a dock 1,029 feet in length at a contract price of nearly $4,500,000.

The original dock had no reënforcing steel and was virtually nothing but a concrete lining of the excavation. The weight of the structure was inadequate and the foundations of coral and mud were porous, plastic, and unequal in bearing power. The revised plan for the dock was unique in its conception, with a foundation to be built in sixteen sections. Each of these was a reënforced-concrete block weighing 7,500 tons, built on a floating dock and lowered under the water by means of a floating and ballast tank. These blocks were to be placed upon a prepared crushed-rock bed and, after settlement, must rest on a plane not more than one and one-fourth inches from the established grade.

As each section was placed on the foundation fifty-two feet under water, the sides of that section were built in the steel cofferdams which formed the end of the ballast tank and concrete was carried down these cofferdams to complete, under the center of the tank, the floor of the individual sections. As each section was completed, the ballast tank was pumped out and floated clear of the structure built within it. When the sixteen sections had been completed, voussoir blocks weighing 150 tons each were placed in a semicircle on the foundation at the end of the dock to form the curved inner end of the basin. The sill and slots were made of granite imbedded in the outer section foundation to form the support along the bottom and sides of the floating steel gate which closes the sea end of the structure. The sections between the sixteen blocks were poured with concrete so as to make the whole structure a monolith before unwatering. The pump well for the pumps used in emptying the dry dock was a separate structure built alongside the outer end of the dock.

In this remodeled structure approximately ten million pounds of Pennsylvania steel was used. The keel blocks of ohia came from Hawaii, the granite and 140,000 barrels of cement from California. Two local quarries, opened and operated to supply crushed rock for the concrete, were exhausted.

Work on the new plan was started in January, 1915, and in April, 1917, our country went to war. The Shipping Board, the War Trade Board, the Price Fixing Board, and other government agencies successfully demoralized all the conditions under which the estimates of cost had been made and freight rates, wages, and material costs were increased greatly in excess of contract prices. The work, however, was completed and the dock turned over to the government in July, 1919, practically ten years after the award of the first contract. As the contract price was a fixed lump sum, it was extremely difficult to reopen the question of costs, even though government agencies had been wholly responsible for destroying the basis upon which those costs were figured and agreed upon. After ten years of work, the contractor was fortunate under all the conditions to have completed the undertaking, even though with the extra allowance finally made by the government, there was absolutely no profit.

During and since the construction of the dry dock, there have been created, tributary to it, several thousand feet of wharfage, a marine railway, oil and coal storage and fueling stations, ammunition depots, stores, machine shops, a hospital and an administration building, officers' quarters, barracks, wireless towers, and many other adjuncts to form one of America's largest naval stations. On Ford Island there has been created a

flying base for land and sea machines, and many other projects to augment the Navy's equipment are being arranged for.

The development in size of naval ships has made necessary the further widening and deepening of the channel; and, in December, 1926, two contracts were awarded for the removal of a total of approximately nine million cubic yards of material from the channel and the anchorage basin within the lochs. In this second large dredging project—nearly twice the size of the first big contract of eighteen years ago—the calls for bids provided for dividing the work into sections representing the sea or outer channel and the coral points within the harbor in one group, and the shell, sand, silt, and broken coral from the floor of the inner basin, in the other. The United Dredging Company of Oakland, California, secured the latter sections of the work and the Hawaiian Dredging Company the bar and hard coral sections. The two contracts represent an expenditure of about $4,200,000, or $1,700,000 less than the amount provided by Congress for the work. Five dredges, representing four different types of excavating machinery, are now at work. Three of the machines that were employed seventeen years ago on the first large dredging contract are being operated on the present one. A new machine of the latest shovel type has been added to the equipment and much dependence is being placed upon the work of this machine to enable the contract to be completed within the specified time.

When this wider and deeper channel is completed, navigable water will be available for any battleship of the United States Navy to enter, maneuver, and anchor within the protection of Pearl Harbor. The extension of the anchorage basin within the harbor to permit the accommodation of a large part if not the whole of the Pacific fleet will probably follow and this can be accomplished at comparatively small cost.

For obvious reasons, a more detailed description of the equipment of the naval station is not available; but it is permitted to state that a total of approximately fifty million dollars has been expended on this naval base, which for many years was believed to be a vision with small chance of realization.

Ballistic Engineering Problems: Empirical Summaries

By L. THOMPSON, *Physicist, Naval Proving Ground, Dahlgren, Va.*

THE most important objectives of ballistic investigation at the present time are those concerned with uniformity. It is of greater practical interest, for example, to learn how to cause the gun, as a heat engine, to execute its cycle uniformly from round to round than it is to increase, or even to maintain, a particular thermodynamic efficiency. Statistical evidence indicates that such development is a primary requisite, in many cases, for marked improvement in the precision of gunnery, however good projectile design and nominal exterior ballistic performance may be. This refers to normally accurate conditioning with respect to fire control and does not mean, of course, that moderate or large-range deviations always originate in variations other than those of flight characteristics. It is rather that deviations from exterior uniformity of the latter nature are usually the direct result of some abnormality developing initially within the gun.

One of the difficulties in establishing satisfactory ballistic engineering practice occurs through the frequent necessity for acceptance of inadequate sampling in the essential experimental work. The number of specific trials which can be made per condition is sometimes too small to secure very reliable results, particularly in the case of large-scale ordnance. This is not entirely a matter of prohibitive expense. For example, a practical limitation may be introduced by a rapidly changing status of the bore as the number of cycles is increased. The excessive rate of change of bore contour and the extreme nature of the erosion phenomena associated with the gun, comparing other heat engines, are a direct result of the tremendous rates at which energy is dissipated. During the working cycle of a major-caliber gun the average "horsepower" of the system may have a value of the order of that for the combined power plants of all of the ships of the United States Navy. For modern, high-power guns it is perhaps thirty or forty horsepower per pound of motor. Automatically, and essentially beyond control, there occur in connection with the various phenomena differences of state which are important and which are not necessarily subject to reliable compensation in the interpretation or prediction of results. The numbers of rounds which may be taken in small groups as identically conditioned are therefore somewhat limited.

As an example of one statistical dilemma, it may be noted that the contribution to interior ballistic dispersion of factors not inherently associated with any one powder as distinguished from another is often sufficient to mask such variations as might be attributed to differences in powders. Tests for uniformity can thus be significant, under those circumstances, only if very large samples are fired; that is, tests to distinguish powders as of good or of poor regularity,* etc. But tests of quite satisfactory magnitude may not only introduce appreciable probability of varied conditioning during their development, but will also sometimes seriously deplete the supply of material in the lot.

The preceding notes with respect to the sampling problems of large-scale ballistics are possibly sufficient to emphasize the practical importance of having a substantial basis for the association of experiments conducted at reduced scale or at different scales. It is unavoidable that the engineering structure of ballistics shall depend to a considerable extent on empirical summaries. Except for the solution of certain problems of exterior flight under a limited range of conditions, for which the dynamics of the spinning top provides a close analogue, there is little in the way of

*See Note 1 at end of article.

formally complete analytic reduction of the principal ballistic problems. Conditions usually employed are sufficiently extreme, in fact, to render the ordinary machinery of dynamics inadequate as a vehicle for rigorous solution and, in most cases, difficult of statement. Treatment of ideal or simplified special cases is not often of great practical value because of the extent of departure from actual experience which is necessary in order to accomplish reduction.

for a limited field. This procedure is typical of much engineering analysis, particularly in applications of hydrodynamics. If properly verified, it affords a valuable condensation of information and a convenient graphical basis for continued modification in accordance with latest experimental averages.

Penetration of Armor Plate

The curves of Fig. 1 define an armor penetration coefficient, a function of the

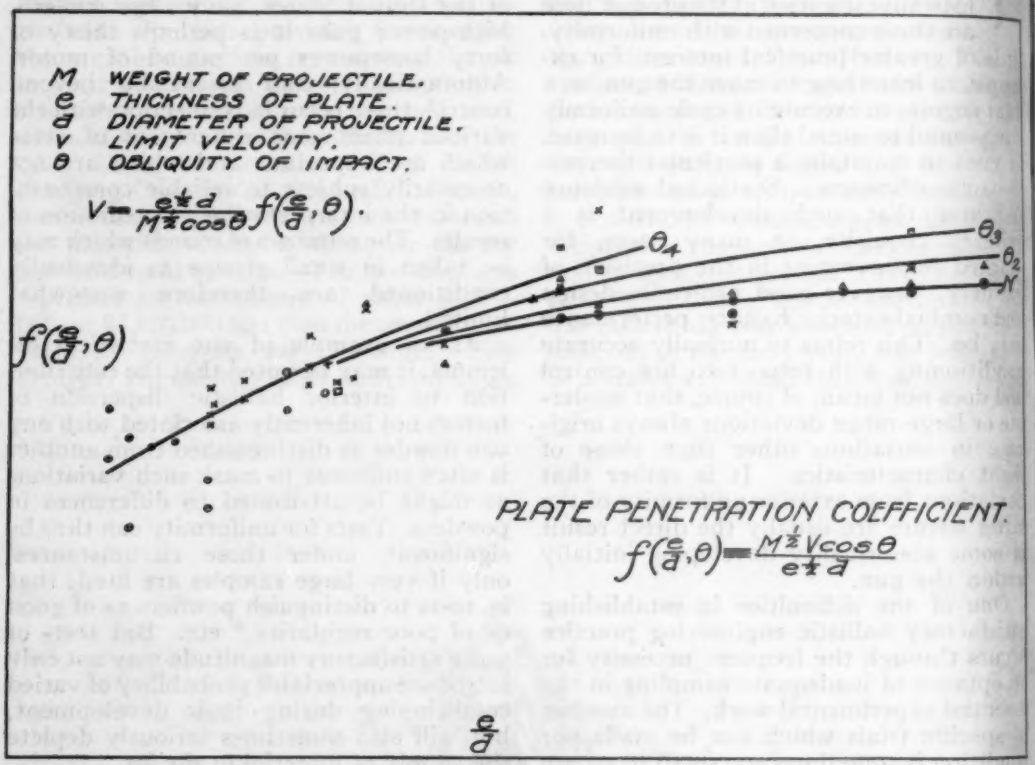


FIG. 1

As is well known, it is occasionally possible to facilitate the arrangement of empirical summaries through the identification of certain ratios as independent variables, the latter being dimensionless combinations of the significant specific variables of condition which, together, determine the characteristics of interest. A representative coefficient is accordingly defined as a function of the ratios and, if actually descriptive of the general range of observed data within the order of experimental error, the conditions for reduced-scale or model tests are prescribed

ratio of plate thickness and projectile diameter and of the angle θ; it represents limit velocities (V_l) required for complete penetration of plate of thickness e, with obliquity of impact θ (the angle between tangent to trajectory and normal to plate) when attacked by a projectile of diameter d and weight M. This coefficient

$$(I) \qquad f(e/d,\theta)=KM^{1/2}V_l\cos\theta/e^{1/2}d$$

was developed through the assumption (of the essential variables as)

$$V_l\cos\theta=V_n(M,\theta,e,d,T_0)$$

in which T_0 is a quantity having the dimensions of energy, $K = T_0/ed^2$ representing the specific quality of the plate; similar projectiles are implied. The derivation on this assumption has been outlined in an earlier discussion.[3] It is more general than the first coefficient defined therein, since recent experiments have shown that it is capable of predicting the order of results with dissimilar projectiles, although the latter may require moderate adjustment of the coefficient curves for precise representation.

It will be noted that the condition for extension in scale (with one class of plate and projectiles) is that the ratio of plate thickness to projectile diameter be maintained at the same value and, also, the obliquity of impact. It is required to determine one set of experimental F curves for each class of projectiles and of plate characteristics. Within a reasonable range of conditions, model tests with thinner plates and smaller projectiles may be accepted as reliable criteria of the results to be expected for the same ratios at full scale. The application of the empirical framework employed is accordingly not merely as a basis for general representation of penetration data but also in prescribing what section of data (from previous experiments) is most legitimately used (i.e., similarly conditioned) for direct comparison in order to improve the statistical significance of a particular test. Its reliability is gaged entirely by the practical results of repeated trial. The form indicates, however, the nature of an appropriate distribution of qualifying conditionings for such trial. The dispersion of plotted points for the present collection of experimental data is measured by a probable deviation from the curves of 2–4 per cent; this is fairly small in view of the relatively large probable error of any individual limit determination, particularly at the higher obliquities. The dispersion is, for example, very much less in the case of the points for normal or nearly normal impact.

In addition to the data which determine the limit velocity functions, there has been obtained a series of values of velocity remaining after the projectile has passed through armor plate. These can now be measured with satisfactory accuracy by oscillographic registration of the times at which sets of double contact screens behind the plate are bridged by the projectile, and they define the absorption functions. Energy loss increases and momentum absorption decreases as the striking velocity is increased beyond that of the limit for the plate. From the limit and the absorption functions it has been possible to establish a laminated or divided-armor coefficient. The latter expresses the relative effectiveness of various armor distributions with respect to solid plate of equal weight.

The following penetration formulas have been more or less generally used in this country or abroad for the representation of plate data and are reviewed at this point in order to facilitate comparison with the preceding description.

(II) $T = K_1 e d^2 (e/d)^{1/3}/\cos^2\theta$;

or $V = K_1' e^{1/2} d (e/d)^{1/6}/M^{1/2} \cos\theta$

(III) $V_1 = C e^{\cdot 7} d^{\cdot 75} f_1(\theta)/M^{1/2}$

(IV) $V_1 = k(de^2/M)^{1/3}$ (for normal impact).

The notation is that previously given, k, K, and C indicating constants and T the kinetic energy at impact. It will be observed that the first expression, (II), which originated with the firm of Krupp, is stated in a form somewhat similar to that defining the coefficient (I), but restricting the latter by analogy to $f \equiv (e/d)^{1/6}$ and no variation of the coefficient with θ (the obliquity) is assumed. The formula (III) is essentially that of J. de Marre, but with the introduction of the term $f_1(\theta)$. The quantity C is taken to be a characteristic constant representative of specific plate quality. This develops from the assumption that the striking energy required for complete penetration is proportional to some power of the projectile diameter and of the plate thickness. It is now identified empirically by the exponents noted in the above form. The use of such a set of constants, if of inexact value, or if more fundamentally incorrect because of a requirement for series representation, will result in C values which vary among test combinations of d, M, and e. This would occur not because the plate quality actually varies to that extent but because, in effect, C is not constant over a variety of test conditions. As has been observed heretofore[4] the formula (IV), which was

stated by Lieutenant Colonel Moisson, may be restated (for $\theta=0$) in accordance with the coefficient (I), in which case

$$f(e/d)\equiv(e/d)^{1/6}\cdot(M/d^3)^{1/6}$$

Inasmuch as the second factor in this expression is a constant for similar projectiles, the Moisson formula is a special case of that of Krupp.

Erosion Rates and Life of Gun

Although the modern gun employs what appears to be a highly effective gas seal around its piston, in the form of the forced and engraved rotating band, there is, nevertheless, a very small annular orifice during certain phases of the cycle. The point at which maximum pressure is attained corresponds to a projectile displacement of several calibers, ordinarily. Immediately subsequent to the full engraving of the band, a displacement of a few inches at most, the gun tube begins to expand appreciably from the position of close contact with the engraved surface. Thus from a projectile orientation near the origin of bore until it is well beyond the position of maximum pressure, the seal will not be tight. The same thing is true as the projectile reaches the vicinity of the muzzle, but for a different reason. The very great quantity of gas which expands from the muzzle orifice at extremely high velocity as the rear of the band breaks contact with the bore, causes rapid erosive wear of the bore surface at the muzzle. As this develops farther in the bore with each firing, the point at which the high-velocity expansion becomes seriously effective progresses inward from the muzzle. It is fairly evident, then, that the region of maximum rates of wear will include both the muzzle and the origin of bore if, as herein assumed, the principal agency of erosion is the mechanical action of the high-velocity flow of hot gases over the surface, the magnitude of wear varying with the quantity of gas, the temperature of the adjacent gas layers, the velocity of flow, and the contour of the surface. The rate at the origin has been found to be a generally significant criterion of the wear phenomena throughout the bore. That the origin is the position of maximum rate, is the result of several factors of conditioning which tend to enhance the intensity of erosive action in the vicinity. The surface of the bore is here in contact with gases at higher temperatures than in any other phase of the cycle; that is, at the point where the absorption of energy from the gas in external work on the moving system is still small and thus where the temperature most nearly approaches that of combustion for the powder. Further, the contour of the bore at this point has a discontinuous slope; the presence of a sharp corner enhances the mechanical action of the gases in flow and increases the temperature reached by the bore surface, the latter because of the greater ratio of heating area to that of the section available for conducting the heat away from the "point."

The discussion of the preceding paragraph emphasizes the primary function of increase in the temperature of combustion of the powder and of increased quantity of gases expanding and circulating at high velocity, as important agencies in producing higher erosion rates. The decrease in rate which occurs as the gun wears may be due to the fact that the bore contour near the origin gradually develops a less severe slope, not reaching the minimum diameter for a considerable distance. Not only is the mechanical action of the impinging gases less, accordingly, but the seal of the rotating band should be relatively better over the first few calibers than in a new gun. This follows from the result that the initial engraving does not cut to full depth, and the gun expansion is compensated as the projectile is displaced along the bore to points of smaller diameter, the greater residual section of band being more nearly sufficient to fill the bore. General Charbonnier has suggested a point of view regarding erosive action[4] which attributes the results primarily to the secondary turbulent motion of the gases behind the projectile, and does not accept that the gas actually expands through the "moving orifice." The latter consideration is contrary to present photographic evidence, however.

Not only is the rate of enlargement of the bore at the origin found to be a valuable index of certain characteristics of the gun system, but the total enlargement at this point is a satisfactory measure of probable loss of muzzle velocity (with a fixed charge) at various stages in life.

Thus a generalization regarding erosion rates can be made to establish not only a basis for life-of-gun estimation but also for the prediction of some of the characteristics of velocity-loss erosion curves.[6] It identifies a scale of "equivalent round" ratios by which the relative effect of charges other than standard (full) value may be incorporated in the gun record.

In recent summaries of enlargement data it has been found advantageous to define a wear or enlargement coefficient

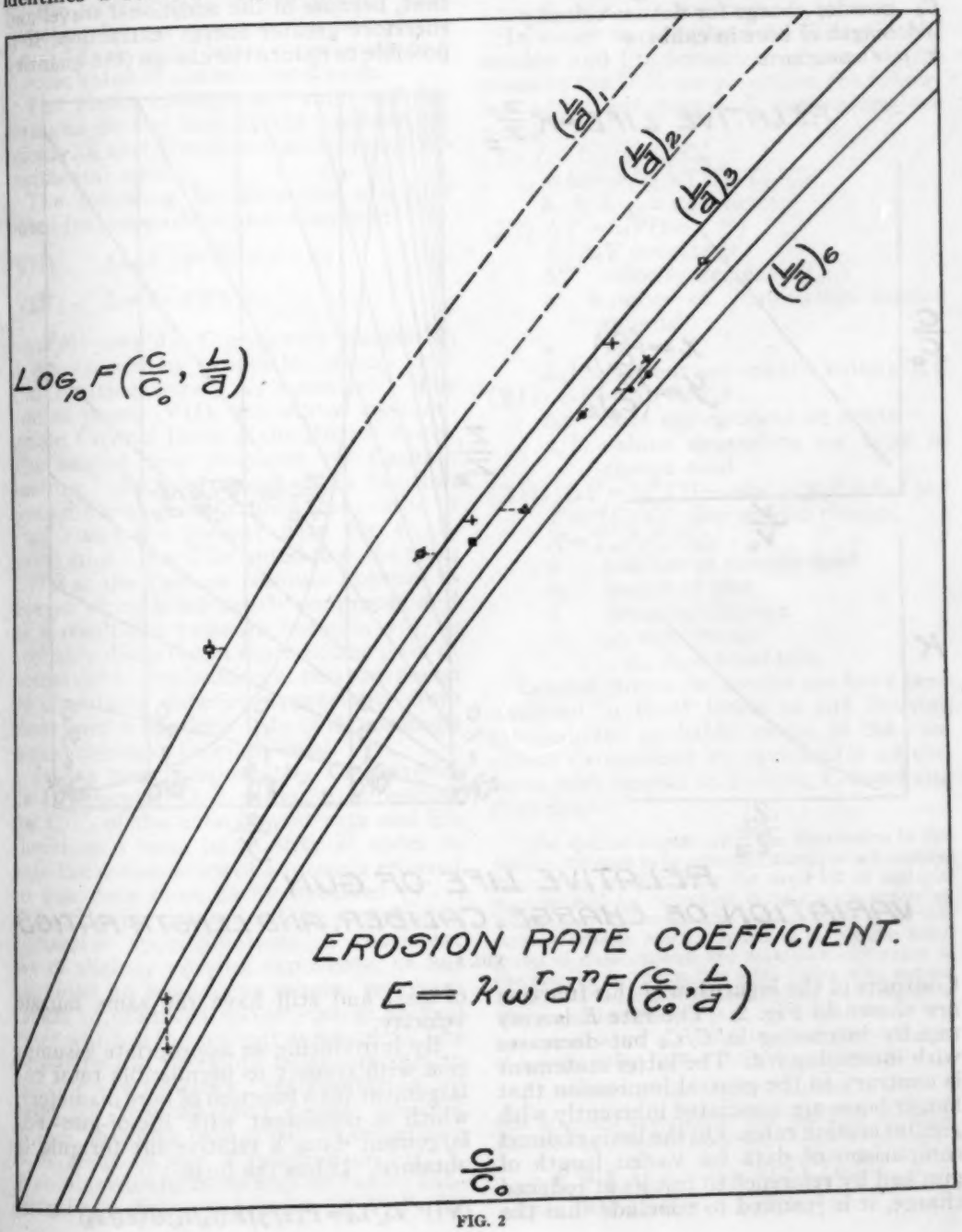


FIG. 2

(V) $F(C/C_0, l/d) \equiv E/k(w/d^3)^r d^p$

E enlargement per round at origin of bore
d diameter of bore
w weight of projectile
C weight of powder charge
C_0 powder charge for datum velocity
l/d length of bore in calibers
k, p, r constants

moderate increment in time interval in the bore (either for the reduced velocity or because of the longer bore) is insignificant in effect comparing that of even a slight change in charge. In other words, the important thing about a long-bore gun is that, because of the additional travel and therefore greater energy extraction, it is possible to reduce the charge (the quantity

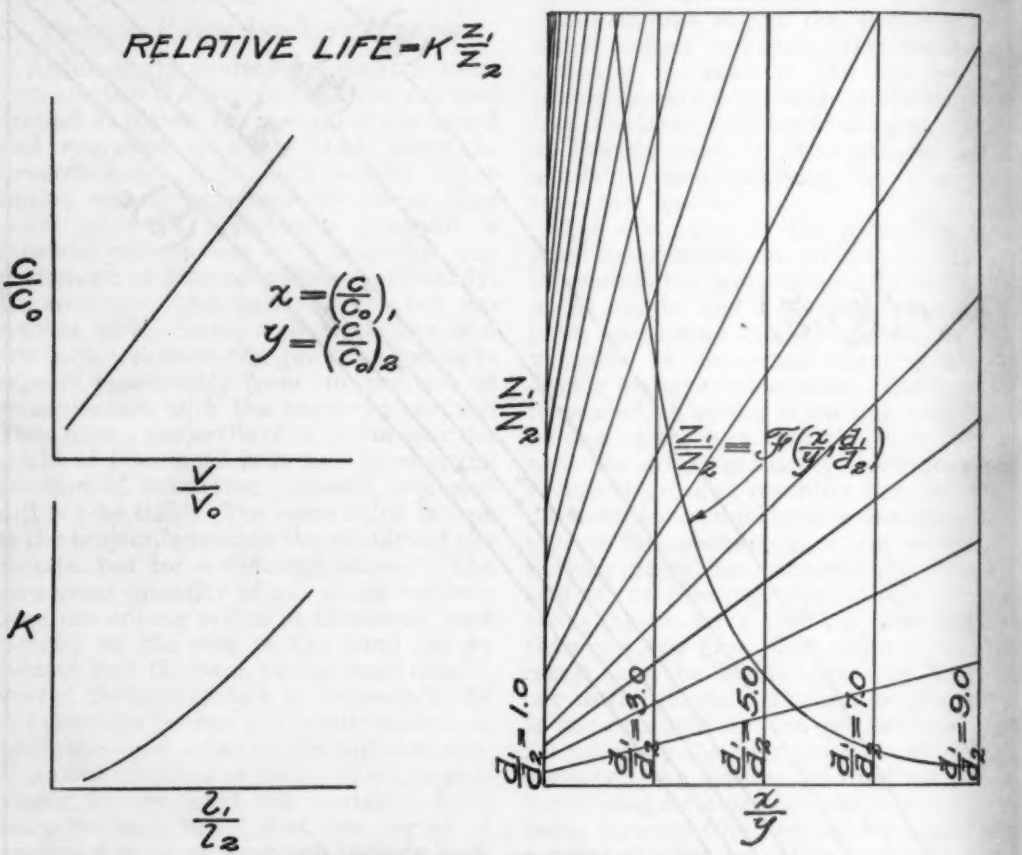


FIG. 3

Contours of the logarithm of this function are shown in Fig. 2. The rate E is very rapidly increasing in C/C_0 but decreases with increasing l/d. The latter statement is contrary to the general impression that longer bores are associated inherently with greater erosion rates. On the basis of direct comparison of data for varied length of gun and by reference to results at reduced charge, it is justified to conclude that the of gas) and still have the same muzzle velocity.

By introducing an appropriate assumption with respect to permissible total enlargement (as a function of bore diameter), which is consistent with life-of-gun—enlargement data, a relative life formula is obtained. It has the form

(VI) $L_1/L_2 = P(x/y)K(l_1/l_2)U(d_1/d_2)$

x and y being C/C_0 values for the two guns. Fig. 3 shows the equivalent graphs. The function Z_1/Z_2 of the figure is identical with the product $P(x/y)\cdot U(d_1/d_2)$. The scale to be used on the various vertical lines through the d_1/d_2 values is calibrated by the intersections of the sloping lines radiating from a point at the left of the figure. Each of the latter corresponds to a specific value of the relative Z scale.

The above enlargement rate and life formulas do not include the pressure explicitly, a fact consistent with recent experimental results.

The following life formulas are here noted for comparison and reference:

(VII) $L=K_1/p^{1.7}V^2d(d-K)$

(VIII) $L=AxyCV^2/d^2l$

$x\equiv x(p)$; $y\equiv y(d)$; C projectile weight/d^3; A determined by properties of gun steel and rotating band; K_1 constant. The first of these, (VII), was stated by Lieutenant Colonel Jones of the British Army. The second was proposed by Captain Justrow.[7] Both forms define life distributions differing considerably from those of Fig. 3 and the present data for U. S. naval guns. It will be noted that the term CV^2/l in the Justrow formula appears in a sense which is inherently reciprocal, and as a result the pressure function $x(p)$ is probably distorted in representing a set of actual data. Application of this expression to conditions differing appreciably from those used in the derivation of its constants would therefore be questioned.

It has been proposed by Commander G. L. Schuyler, U. S. Navy, to substitute for C/C_0 of the enlargement rate and life functions a term in velocity in order to gain the convenience of a formula referred to gun data most easily obtained (V, l, d, w). Having determined, by a method of successive approximations, a consistent set of slightly varying exponents, he has obtained an equivalent tabular representation of observed service-charge erosion rates which is in excellent agreement. The summary can probably be generalized to provide satisfactory representation of rates for reduced (and excess) velocity values, in which case it will be essentially equivalent to the F function of Fig. 2. A similar rate formula may be had by substituting a linear expression in V/V_0 for C/C_0 and writing the empirical equivalent of the curves of Fig. 2. The C/C_0, V/V_0 line of Fig. 3 is a close approximation for most guns, being a mean value. The result is

(IX) $E=K(w/d^3)^q(d/l)^s(V-k)^r$

K, k, r, q, s constants.

In order to complete the collection of erosion and life formulas[8] of possible interest to the U. S. naval service, the following additional empirical expressions are listed:

(X) $L\equiv L(l/d,\ C/C_0)$
$\equiv kd^p(d^3/w)^q(l/d)^s(C_0/C)^x$
k, p, s, q, x constants

(XI) $\Delta V=\Delta_0V(1-e^{-kn})$
K, Δ_0V constants
ΔV velocity decrease (f.s.)
n number of "equivalent service rounds"
e $2.71\cdots$
Δ_0V apparent asymptotic value of ΔV

(XII) $\Delta V=(a+bd)\Delta d$
Δd bore enlargement at origin
a, b values depending on type of charge used

(XIII) $\Delta V=kPX(1-cd)d^z/(k_1P+k_2X)a_1^t$
$P\equiv f(C_s/C_0)$ (for service charge)
$X=\sum_n f(C/C_0)_r$
n number of rounds fired
a_1 length of gun
d diameter of bore
C_s service charge
z, k, c, k_1, k_2, t constants

Erosion curves for service use have been obtained in these forms at the Proving Ground, the probable values of the constants determined by systematic adjustment with respect to Proving Ground and fleet data.

[1] An outline suggestive of the fluctuation in dispersion measure to be expected among small samples selected at random from the *same* lot of material may be had by collecting certain data regarding differences. Although the least reliable of all dispersion criteria when applied to a specific small group of observations, the maximum difference in the sample, or "range," is a fair index with respect to distribution characteristics among many samples. The probable difference (e.g., in muzzle velocity) for two rounds is $\sqrt{2}\,r$, r being the probable deviation of a single value from a large aggregate mean

$$r=.6745\sigma, \qquad \sigma=\sqrt{\sum d^2/n}$$

(the standard deviation). The probable deviation may also be obtained from (see Note 2 following)

$$r_2=.5978\ \sum^{n-1}|\delta|/n-1=.5978\sum^{n(n-1)/2}|\delta|/\frac{n(n-1)}{2}$$
$$r_3=.8453\ \sum|d|/n$$

$d_{(r)}$ being a deviation from the large group mean, and $\delta_{p-1}=0_p-0_{p-1}$, etc., successive differences (of observations). In the case of small samples, the observed standard deviation is less than the probable actual value of σ, in the Pearson ratio $\sqrt{(n-2)/n}$ a result of a tendency to deviate from a normal frequency distribution as the number of individuals per group is decreased (the large aggregate from which the samples are selected being normal). The observed dispersion measures will accordingly be somewhat less in the average than the true value representative of the system. The probable maximum difference among n rounds may be estimated by means of the value of p from $p^{n(n-1)/2}=.5$ there being $n(n-1)/2$ differences, and the probable maximum is that magnitude as likely to be exceeded (at least once) as not. If the distribution of differences were normal, the probable ratio of maximum separation to probable (observed) deviation, P/r_0, might be obtained from a normal probability table, entering with the computed values of p. For the purpose of this discussion (with $n\leq 8-10$) it is assumed that the approximation is adequate; if $n=8$, $P/r_0=4.72$, $(P/\sigma_0=3.99)$, etc. The corresponding estimate of P/r is then 4.1. In about half of all 8-round samples examined, it is thus expected that the maximum separation in the group will be more than $4.7r_0$ (or than $4.1r$). (Values of this ratio may be compared with the patterns or "rejection criteria" of Chauvenet, Vallier, Mazzuoli, and others for various n; the latter are defined by the probable number of rounds excluded rather than by a constant probability of including all.) If the probability of occurrence of a maximum separation equal to or less than $k(N)r_0$ is changed from 1/2 to 9/10, the value of $k(N)$ is about 6.1. Similarly, another tenth will have extreme separations less than about $3.7r_0$. Yet these differences in uniformity measure may not be interpreted as showing distinguishing characteristics of the material tested by firing eight rounds. The point may be further illustrated by reference to a definition of the standard error of the standard deviation σ. This is obtained as

$$\delta\sigma=\sqrt{\frac{n}{n-2}}\cdot\frac{\sigma}{\sqrt{2(n-1)}}\doteq\frac{\sigma}{\sqrt{2(n-3)}}\qquad(\sigma\text{ observed})$$

If $n=10$, $\delta\sigma\doteq\sigma/3.7$. A 25–30 per cent increase in dispersion measure is thus so frequent that no rejection limit within $1.25\sigma_0$ (σ_0 for average material) could serve any very useful purpose in an attempt to identify good materials based on a 10-round test. In fact, a fraction of the order of one-fourth of all such samples would involve fluctuations sufficient to show at least +15–18 per cent increase. Yet there is no legitimate criterion for distinguishing the assumed inferior powders from the results of such a sample even though the *average* dispersion (σ_0) should be adopted as the high limit. The fluctuation range in which 99.7 per cent of all 10-round samples may be expected to occur has an upper limit of the order of $\sigma+3\delta\sigma$, or about 1.8σ for $n=10$. The (*a posteriori*) probability is clearly not high that the "cause" of a particular small sample dispersion of large value, for example, a mean deviation equal to the limit prescribed for rejection, $\pm(\overline{\delta V}+K)$, is actually a deviation in inherent quality represented by a full history performance $\delta V\geq(\overline{\delta V}+K)$. (The average full history dispersion of the class is $\overline{\delta V}$.) The following possible alternatives may be noted as potential explanation of the observed result $(\delta V)_0=\pm(\overline{\delta V}+K)$]:

C_1 full history record actually between $(\overline{\delta V}+K)$ and $(\overline{\delta V}+K+1)$

C_2 $(\overline{\delta V}+K+1)$ and $(\overline{\delta V}+K+2)$

C_{n+1} $(\overline{\delta V}+K)$ and $(\overline{\delta V}+K-1)$

C_{n+r} $(\overline{\delta V}+K-r+1)$ and $(\overline{\delta V}+K-r)$

there being a possible sampling fluctuation from the respective full history means in each case sufficient to give the result $(\overline{\delta V}+K)$ for the specific small sample. If the probability of each status $C_{(i)}$ is $p_{(i)}$, and the probability is $P_{(i)}$ that, if the status existed, the observation for one sample would be $\pm(\overline{\delta V}+K+\frac{1}{2})$, then the probability that the powder actually has a representative dispersion $\delta V\geq\pm(\overline{\delta V}+K)$ is of the order

$$\sum_{i=1}^{n}p_{(i)}P_{(i)}\Big/\sum_{i=1}^{n+r}p_{(i)}P_{(i)}.$$

Substituting estimated values of the individual probabilities, corresponding to a sample of size 5–8 rounds, and assuming values for probable sampling (fluctuation) deviation and probable actual deviation in powder uniformity which are fairly descriptive, it is obtained that the probability of the significant cause noted would lie in the range 1/4 to 1/10. The magnitude of K arbitrarily adopted for this illustration is such that a fraction a little less than 1/10 of samples fired would prescribe rejection if taken rigidly. A corresponding uncertainty exists regarding the significance of the samples showing acceptable dispersion measure. The probability of the sufficiency-of-quality-deviation cause increases, of course, as the observed dispersion assumes values of larger deviation from the acceptance limit, but is inadequate to provide a substantial basis on which the interests of economy or precision are really served by sorting powders for uniformity by means of very small sample firing tests. If circumstances render a uniformity criterion imperative, then it is essential to recognize the statistical requisites and to employ great care in conditioning the long series of rounds.

[2] It is of possible interest to note the significance of a considerable departure from unity in the value of the ratio $(r_0)_2/r_0$. Such a deviation, the ratio being computed from data for a large number of observations, indicates the presence of a systematic factor in the experiment, such as the erosive wear of a gun and loss of velocity, relative motion of target, etc. The order of magnitude of the effect may be estimated as that value of a systematic correction which, applied to the series of observations, reduces the two measures of probable error to approximate equality.

[3] L. Thompson and E. B. Scott, "Penetration of Projectile.... *Memorial de L'Artillerie Francaise*, T. VI, 1927, (No. 4).

[4] Note (N.D.L.R.) p. 1258, reference (3).

[5] C. Cranz, (Interior) *Ballistics* V. 2, 1926, pp. 157, 433.

[6] See formula XIII.

[7] C. Cranz, pp. 158–9.

[8] Calibration scales for the graphical summaries, and constants of the formulas, may be obtained for service use from the Bureau of Ordnance, Navy Department.

Photo R. Perkins

H.M.S. *QUEEN ELIZABETH*
Flagship of Mediterranean fleet home for a large refit.

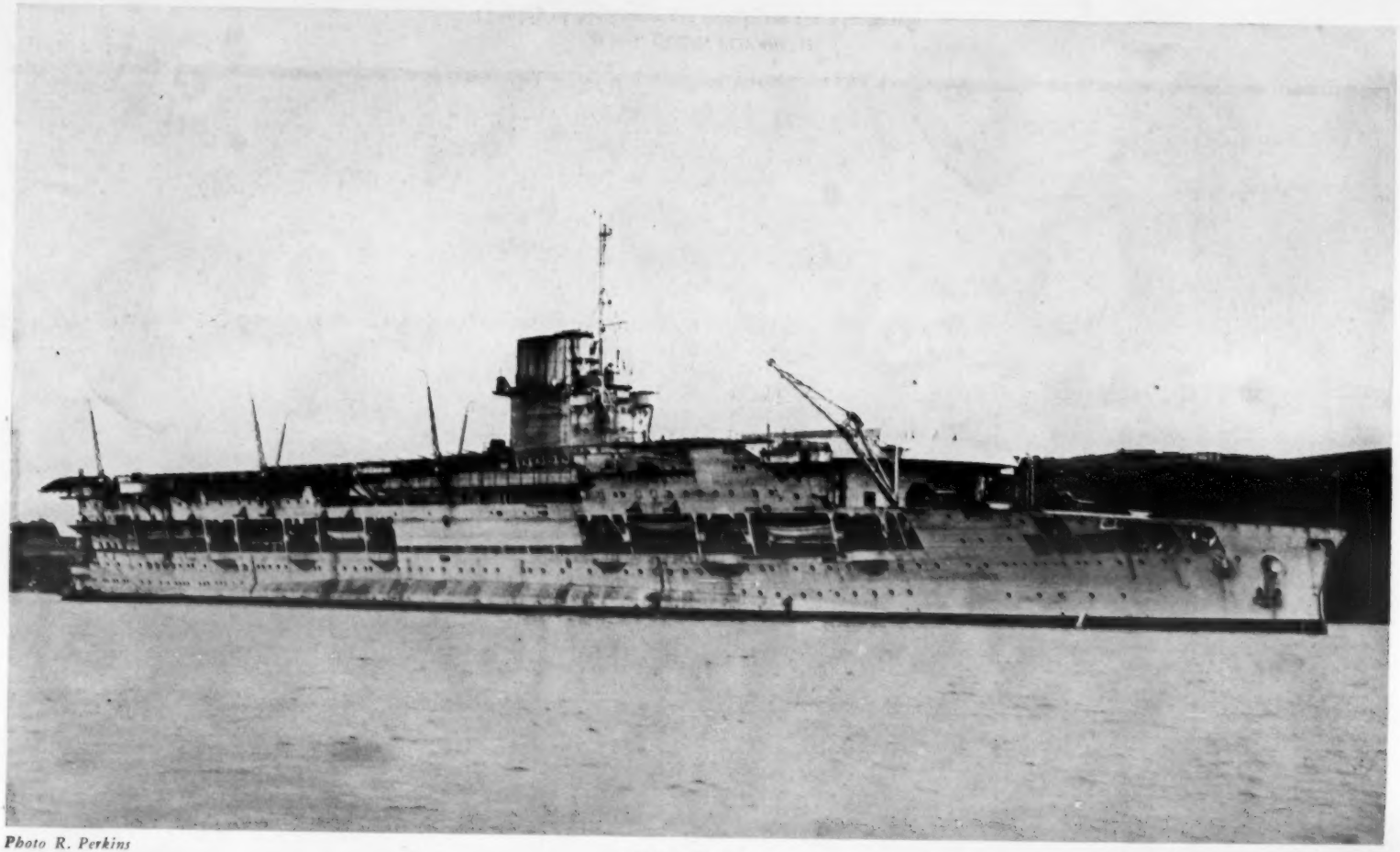


Photo R. Perkins

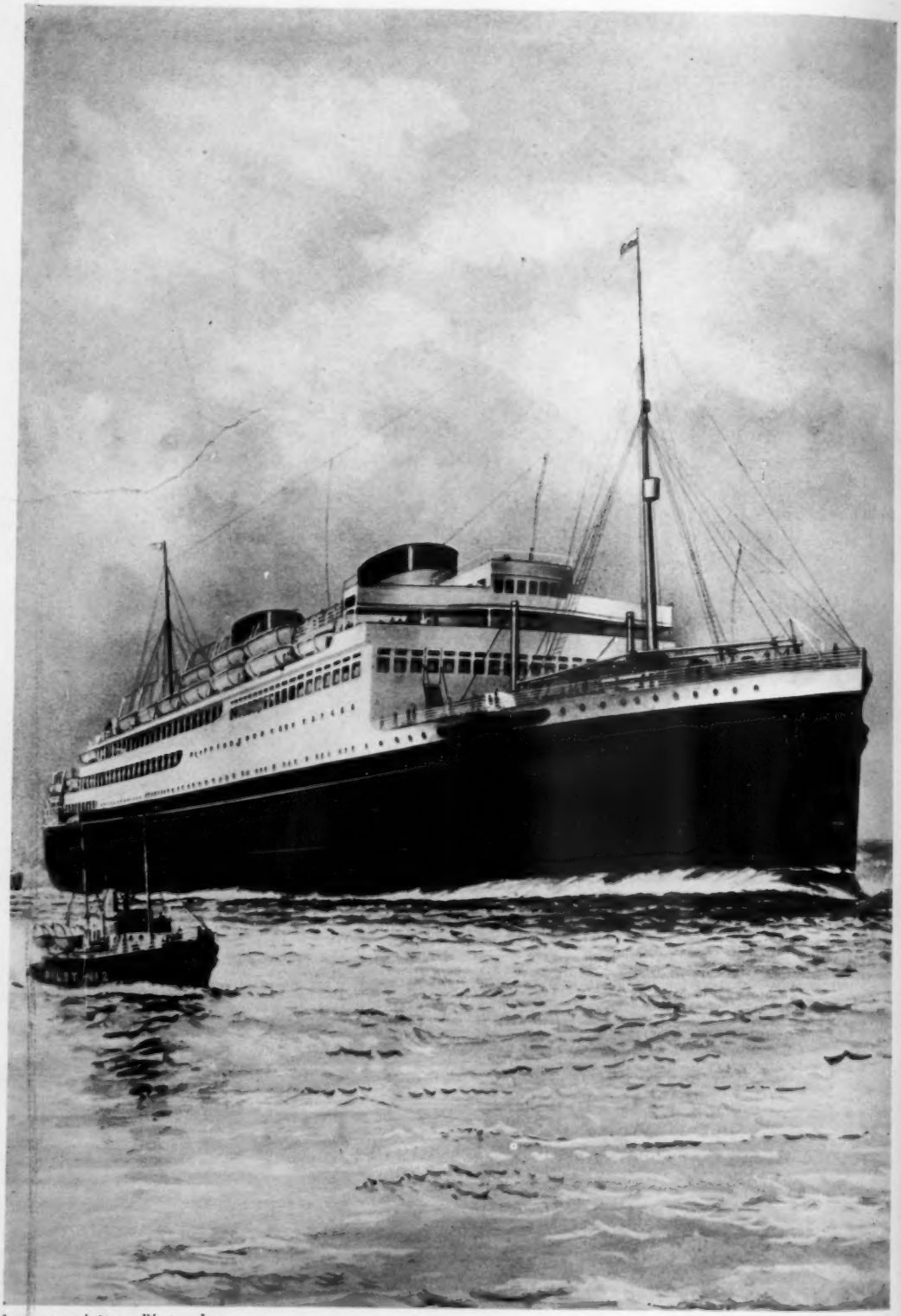
H.M.S. *GLORIOUS*
Showing funnel set on starboard beam and crane swung out for picking up seaplanes.

Photo R. Perkins

H.M.S. *DEVONSHIRE*

Refitted after the explosion in superfiring gun turret aft. Photograph taken just before she left to rejoin Mediterranean fleet.

LIFE OF SIGH.



International News Photos, Inc.

SS. *BRITANNIC*

Largest cabin motor vessel in the world as it will leave Liverpool on June 28, to make its maiden voyage to Boston. It has a tonnage of 27,000, and can accommodate 1,500 passengers.

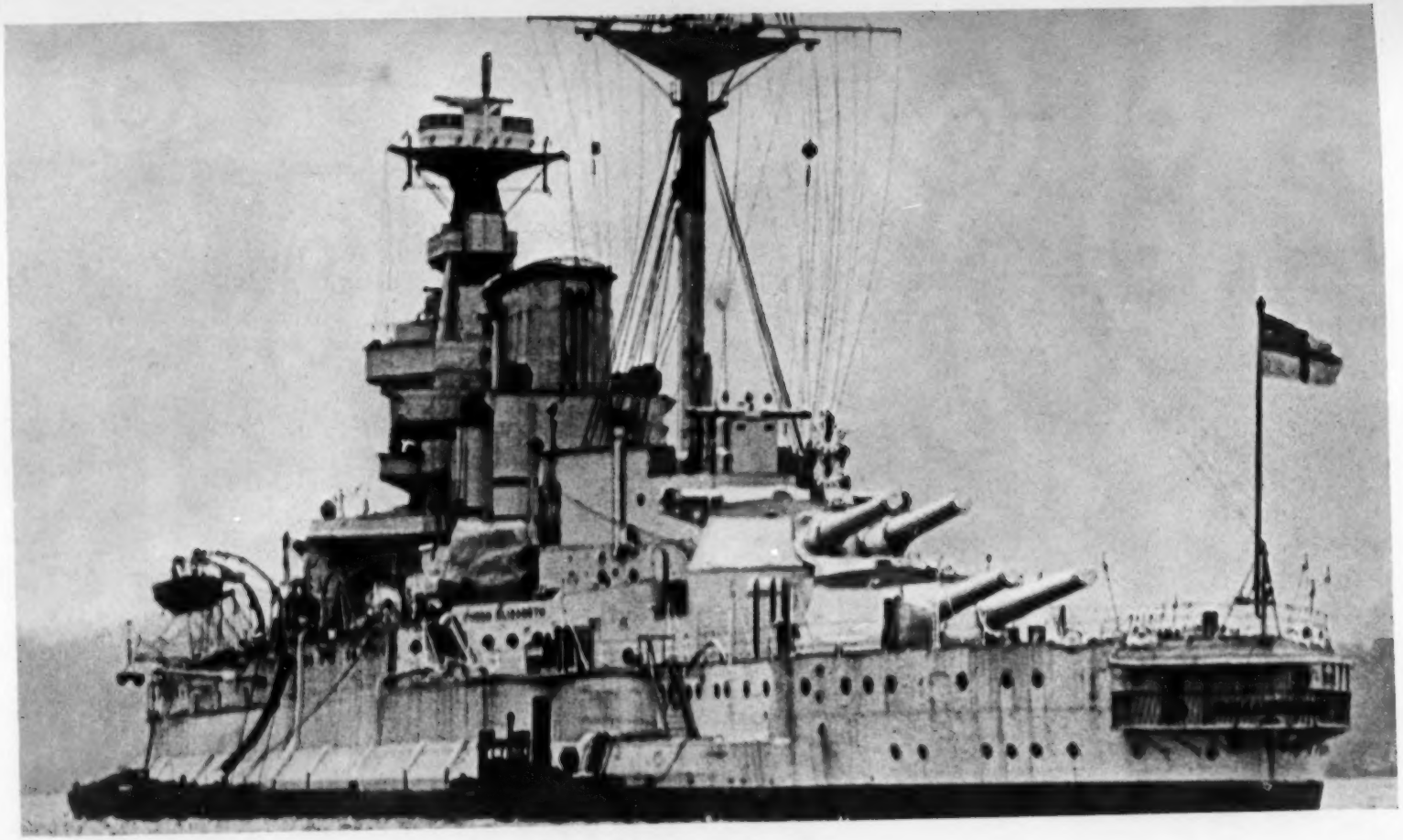
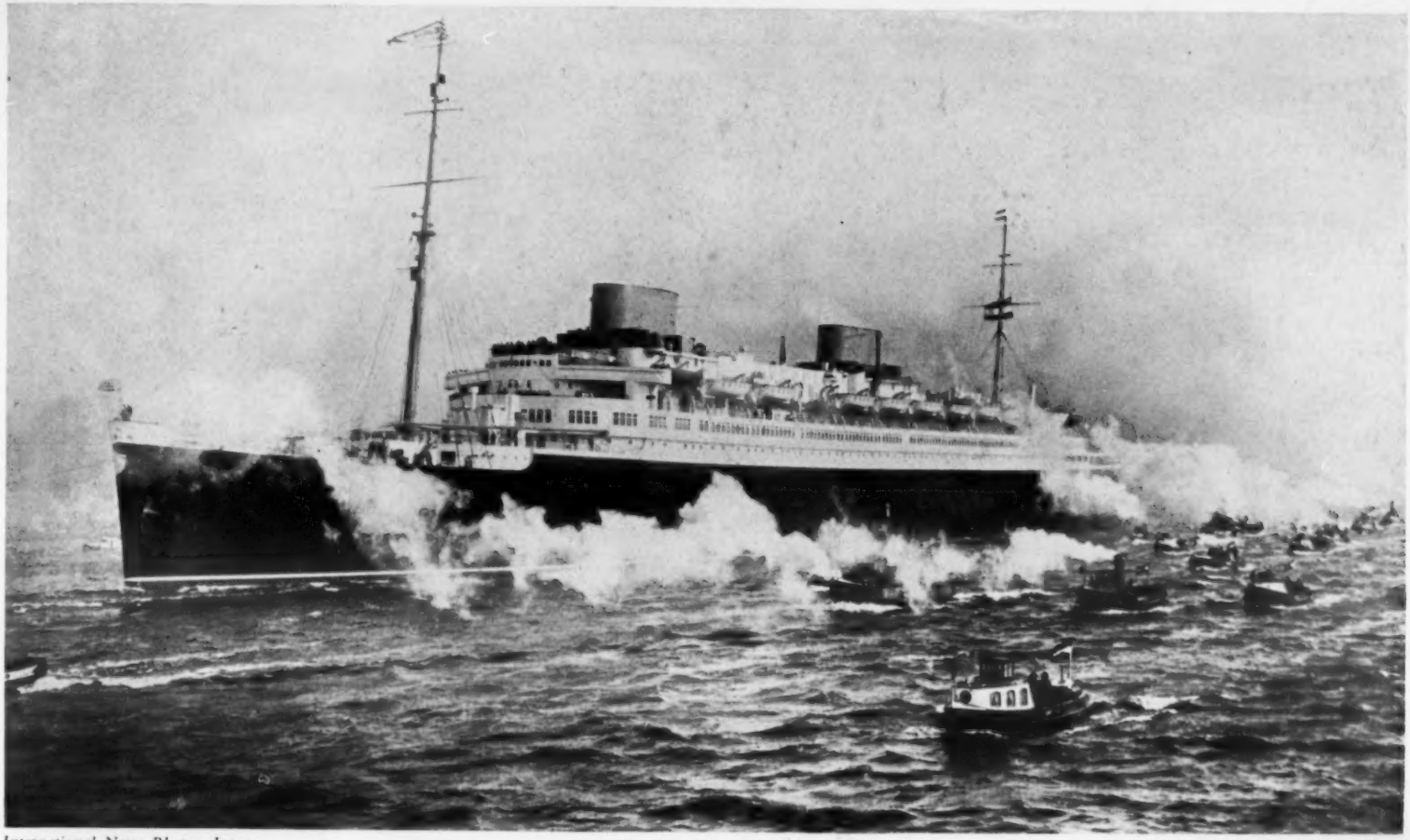


Photo R. Perkins

H.M.S. *QUEEN ELIZABETH*
Photographed from astern.

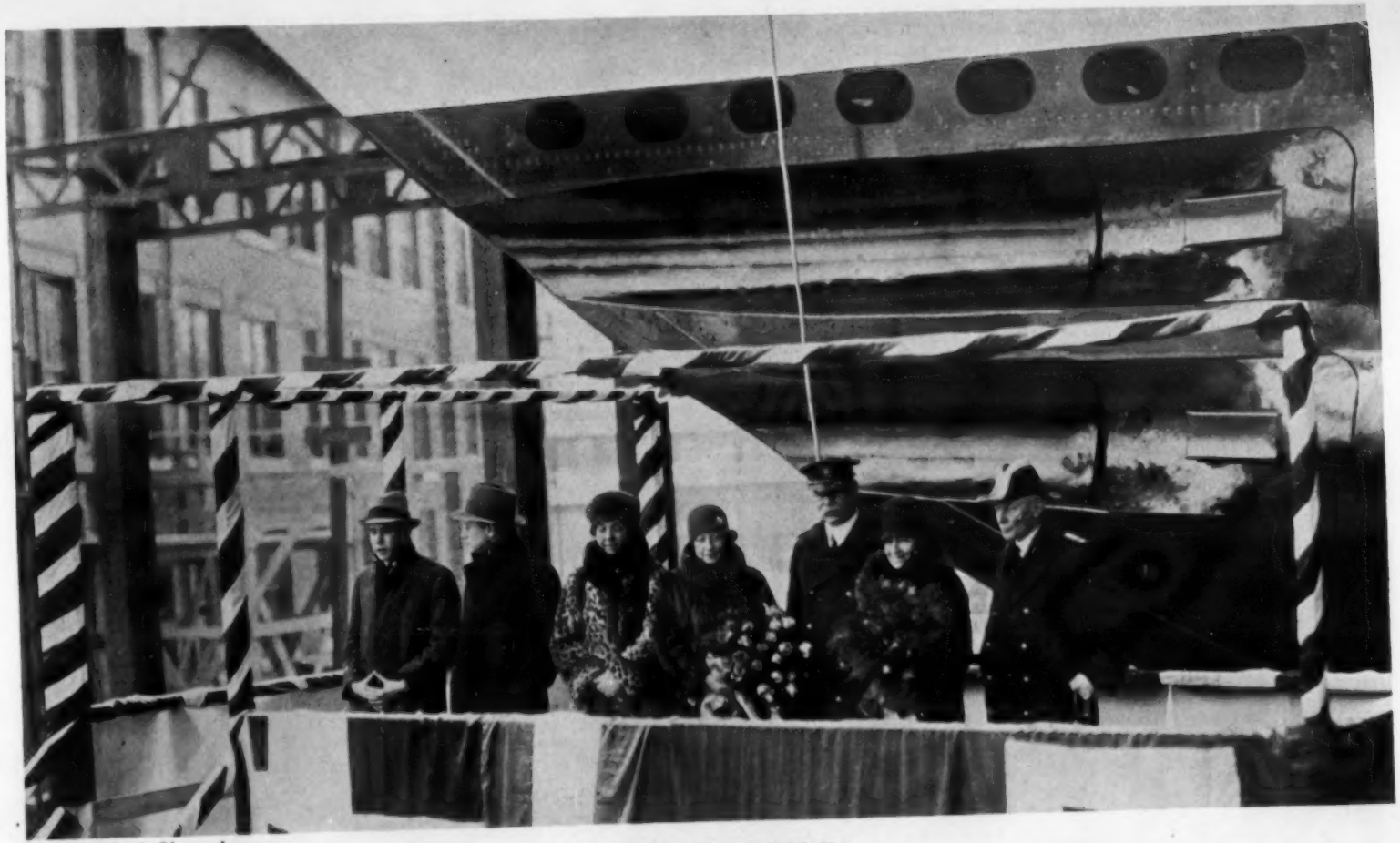
UNIV. OF MICH.



International News Photos, Inc.

FULL SPEED AHEAD! FOR THE GIANT OF THE ATLANTIC

While sirens pierced the air and a miniature navy of excited tugs churned through the water about it, the gigantic SS. *Europa*, new transatlantic liner of the North German Lloyd Line, plowed her way majestically out into the sea. The new ocean greyhound, a sister-ship of the *Bremen*, leaving on her maiden voyage.



Pacific & Atlantic Photos, Inc.

LAUNCHING OF THE U.S.S. *V-5*

Mrs. Charles Francis Adams, wife of the Secretary of the Navy, sponsored the giant submarine at Portsmouth, N.H.

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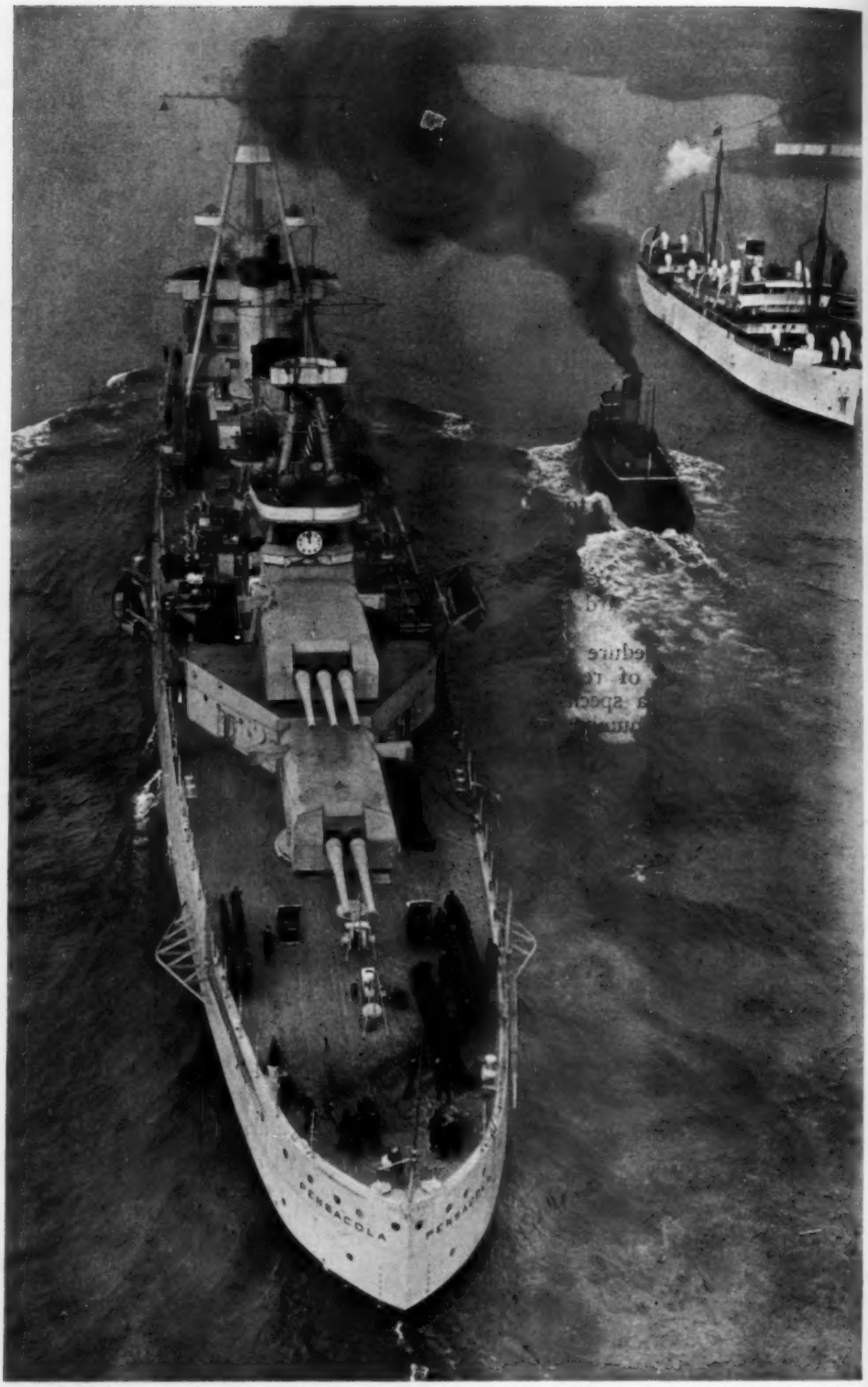


International News Photos, Inc.

U.S.S. *PENSACOLA*

New cruiser starting her shake-down cruise, pictured from the Manhattan Bridge. The *Pensacola* and her sister-ship the *Salt Lake City* are the first cruisers for the United States Navy to be built under the Washington naval agreement.

The Man-Overboard Problem As Applied *to* Destroyers

By Lieutenant Commander G. E. Brandt, *U. S. Navy (Retired)*

STANDARD instructions in various naval publications touching on the procedure of a vessel in the case of a man overboard are sufficiently vague to call forth many a wardroom argument. Uncertainty in the minds of many watch officers as to the best procedure leads to blind "doing what the book says." Want of skill is evident from reports of inspection in the excessive time usually taken to recover a man who has fallen overboard from a vessel under way.

In search of the procedure which gives the greatest probability of recovering the man in the least time, a special study of the problem and a large number of experiments were made on the U.S.S. *Borie*. From these experiments has developed the discussion which follows.

General Considerations

When a man is in the water and a life buoy has been dropped it becomes of the highest importance to recover the man without unnecessary delay. His life might depend upon a matter of seconds. Not all men are good swimmers, but practically all men can keep afloat for a few minutes. It must not be assumed that the man will reach the life buoy, which, from a vessel of high speed, might be dropped at a considerable distance from him. Furthermore, the man might have been injured at the time of falling overboard. Seconds count!

In the problem to be discussed it is assumed that the vessel is a destroyer under way. I do not attempt to say that the results and conclusions arrived at on the *Borie* obtain with equal force when applied to vessels of other classes—cruisers, battleships, tankers, etc. The application is to destroyers. If the discussion contains the germ of an idea useful for cruisers and battleships, so much the better. So far as other types of vessels are concerned, however, I leave it to those better situated than I am to study the problem as applied to each particular type. We must be constantly on guard against a dogmatic insistence that because a certain procedure is found to be best for one type of vessel it will be found to be best for other types also. Principles found to be sound for a given type of ship must be used intelligently when an attempt is made to apply them to other types. Keeping in mind that the following discussion is limited to destroyers, first let us consider:

I. Vessel Steaming Independently

The following instructions are contained in the *Watch Officers' Manual:*

> Stop engines; rudder hard over; back engines; away lifeboats; throw over life buoys. Send lookouts aloft; maneuver to pick up man. At night train searchlight to locate man.

This is hardly helpful to an inexperienced officer of the deck. That we must throw over life buoys, send lookouts aloft, man the lifeboat, and at night use the searchlight admits of no argument. It is not equally clear why the engines be stopped, then backed.

The venerated idea that the engine must be stopped in order to avoid hitting the man with the screw has no application whatever on a destroyer steaming at the high speeds which are customary. Before the engines can possibly be stopped the screw will have passed ahead of the man. Stopping the engines causes the ship to lose speed when speed is most needed should it be decided to turn to maneuver the ship for picking up the man. Is it the best procedure to back the engines and approach the man stern first? The time required to back down and maneuver to a position for recovering the man may be greater than that required to make a turn. Since the higher the speed the

less time required to make a complete turn, in the event that a turn is to be made, it follows that *speed should be increased rather than decreased.* It is a mistake to stop the inboard engine. The turn will be made in the *least time* when *both* engines are making maximum speed.

First thought should be given to picking up the man with the ship, having the boat ready to use only in case of failure. It is quicker, simpler, and more satisfactory, to pick up the man with the ship; but an untrained watch officer might not be successful in doing this. On the other hand, an officer well trained in the maneuver will execute it with confidence and will be successful practically every time. In all cases the boat must be manned and ready for lowering. Fortunately, the failure to pick up the man when the attempt is made is not as serious a matter as it would at first seem; if the attempt has been made according to the principles which will be herein laid down, when failure is apparent the position has been reached most favorable for lowering the boat to pick up the man. Nothing, therefore, is lost; much might be gained.

It is necessary to specially emphasize the desirability of so picking up the man because many man-overboard drills have been conducted, and are still being conducted, with the principal object of getting the boat launched and away from the ship. The boat should be regarded as secondary; a stand-by to be used only in case of failure to pick the man up with the ship. I know that the foregoing statement will sound revolutionary to those officers who have been accustomed to the man-overboard drill with a yeoman standing by with a stop watch to record times of lowering boat, picking up man, and hoisting boat. Of these officers I can ask only that they read the following discussion and give honest trial to the procedure. Remember that the procedure which follows is intended for destroyers.

In all the illustrations given it is assumed that the lifeboat is hoisted on the starboard side of the vessel. Should it happen that the lifeboat is hoisted on the port side a little intelligent consideration will indicate the modification of procedure necessary to meet this condition. It is not proposed to lay down rules of thumb to be memorized, but, on the contrary, to present principles, together with their applications, which when once grasped, suffice to meet any situation with confidence.

Case A. Wind and sea negligible (Fig. 1.—Destroyer is steaming on course *AB*, man falls overboard at *C*.

Procedure: Hard right (or left) rudder,[1] execute turn as shown in Fig. 1, bringing the

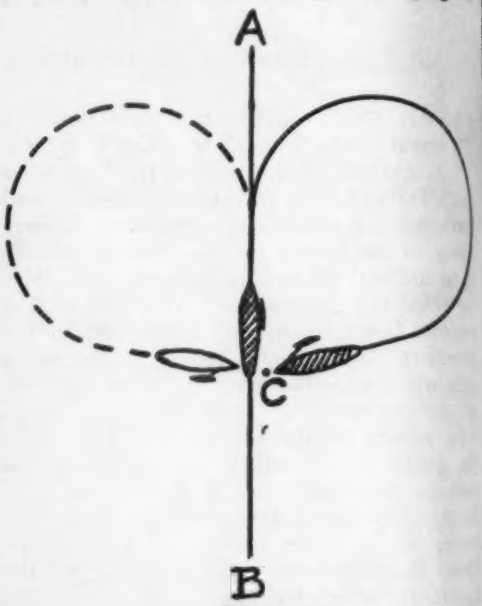


FIG. 1

ship finally to head directly towards the man. Be careful to kill the headway in time by backing the engines so that when the ship's forecastle is abreast the man the ship will be dead in the water. If the ship falls off its heading and steerageway is lost, steer with the engines, ahead on one and astern on the other, to keep the ship headed for the man.[4] Take the man on the starboard side (the lifeboat side) and haul him on board.

As stated before, the inexperienced watch officer might misjudge the turn, the steering, or the speed, and find himself at the end unable to place the bow of the vessel exactly alongside the man without excessive delay. In such a case, launch the boat and pick the

[1] If vessel be making twenty knots or more, continue at standard speed. If vessel be making less than twenty knots, ring up full or flank speed to bring the speed up to or above twenty knots. No advantage is gained by increasing speed if the vessel is already making twenty knots or more; the turn will be made in practically the *same time* at all speeds of twenty knots or more.

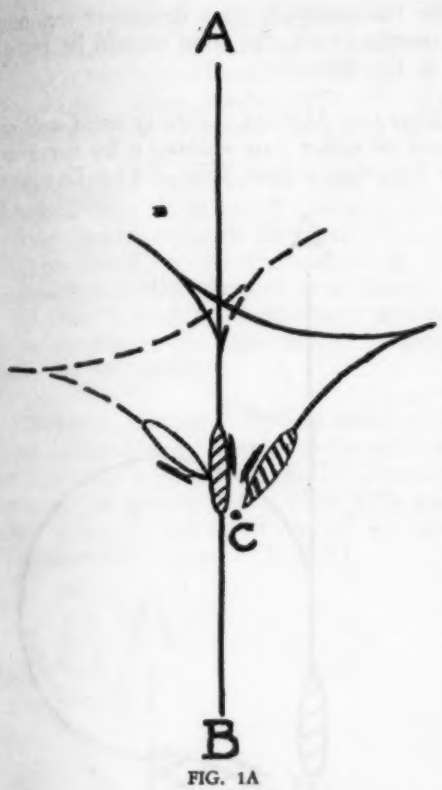


FIG. 1A

man up. After the turn is made the distance is so short that the man can be picked up and the boat returned to the ship in a very short time.

Using the foregoing method on a destroyer steaming at twenty knots, the man should be picked up in five minutes.[2]

Alternate Method. Wind and sea negligible (Fig. 1A)—Destroyer steaming on course *AB*, man falls overboard at *C*.

Engine full speed astern; hard right (left) rudder. When ship begins to gather sternway shift the rudder to hard left (right). When the man is sufficiently ahead of the ship to afford distance for maneuvering, go ahead and proceed to pick up the man as in the last stage of Fig. 1.

Using this alternate procedure on a destroyer steaming at twenty knots, the man should be picked up in six minutes.[2, 3]

FIG. 2

[1] The times given are the average times of good performances of six watch officers of the *Borie* taken from a large number of cases.

[2] It may be noted that at speeds of twenty knots or greater, the advantage of time is somewhat in favor of the turning method. On the other hand, at speeds much less than twenty knots the advantage will probably be in favor of the backing method, provided there is plenty of reserve power available for backing. This because at slow speeds, even if full or flank speed is rung up on the indicators, the time to make the turn is somewhat *greater*. On the other hand, at slower speeds, the vessel may be stopped and sternway acquired in *less* time.

[3] With a strong wind blowing it is necessary to head to windward of the man and make allowance for drifting. When the ship is dead in the water it will drift rapidly to leeward and, unless allowance is made for this, the man will get across to the weather side of the ship. It is much better to overestimate the drift than to underestimate it. Experience has shown that the tendency of inexperienced officers is to underestimate it.

Case B. Strong wind and sea ahead or on either bow making a lee necessary for lowering a boat (Fig. 2).—If there be strong wind and sea, it is desirable that when the ship brings up close to the man, it at the same time head in such a direction that a lee will be made for lowering the boat, which of course is necessary when the attempt to pick up the man with the ship fails. This is a consideration governing the procedure of the several cases which follow (B, C, D, and E).

Destroyer is steaming on course *AB*. Man falls overboard at *C*. Wind from one of the directions shown by arrows (1, 2, 3).

Procedure: Hard left rudder; execute turn as shown in Fig. 2, bringing the ship

FIG. 2A

finally to head towards the man. Take the man on board on the starboard side (the lifeboat side); then proceed as in Case A.[4]

By this method, on a destroyer steaming at twenty knots, the man should be picked up in five minutes.[2]

Alternate Method. Strong wind and sea ahead on either bow making a lee necessary for lowering a boat (Fig. 2A).—Destroyer

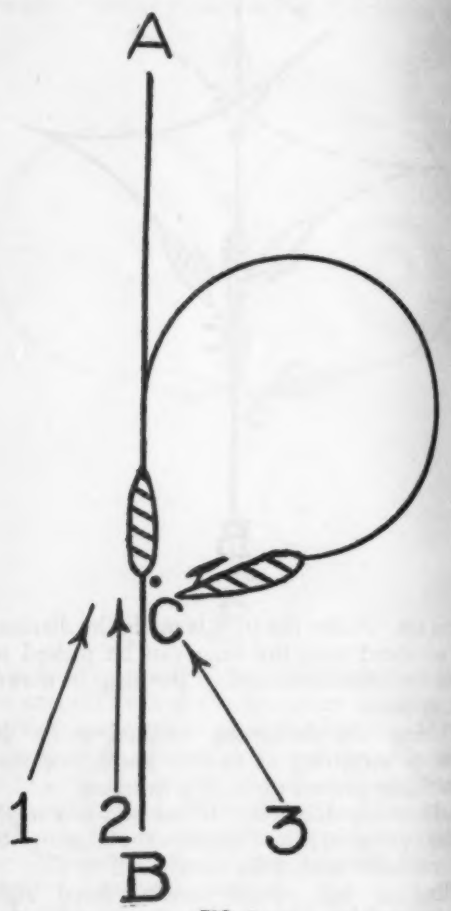


FIG. 3

steaming on course *AB*, man falls overboard at *C*. Wind from one of directions shown by arrows (1, 2, 3).

Engines full speed astern; hard right rudder. When ship begins to gather sternway, shift rudder to hard left. When the man is sufficiently ahead of the ship to afford distance for maneuvering, go ahead and proceed to pick up the man as in last stage of Fig. 2.

By this method, on a destroyer steaming at twenty knots, the man should be picked up in six minutes.[2, 3]

Case C. Strong wind astern or on either quarter making a lee necessary for lowering a boat *(Fig. 3).*—Destroyer steaming on course *AB*. Man overboard at *C*. Wind from one of the directions shown by arrows (1, 2, 3).

Hard right rudder; execute turn as shown in Fig. 3, bringing the ship finally to head directly towards the man. Take the man on board on the starboard side (the lifeboat side), then proceed as in Case A.

By this method, on a destroyer steaming at twenty knots, the man should be picked up in five minutes.[2]

Alternate Method. Strong wind astern or on either quarter making a lee necessary for lowering a boat (Fig. 3A).—Destroyer steaming on course *AB*. Man falls overboard at *C*. Wind from one of the directions shown by arrows (1, 2, 3).

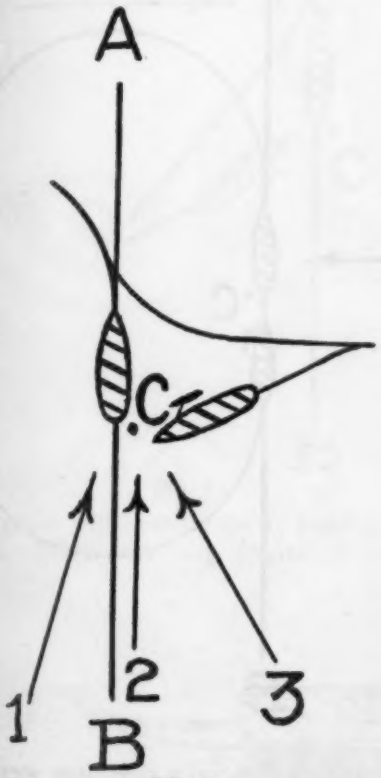


FIG. 3A

Engines full speed astern; rudder hard left. When ship begins to gather sternway, shift rudder to hard right. (Caution: The tendency of the ship to back stern into the wind may make this maneuver difficult. The tendency to back into the wind might be overcome by using the engines, going ahead on the starboard engine.) When the man is sufficiently ahead of the ship to afford distance for maneuvering, go ahead and proceed to pick up the man as in the last stage of Fig. 3.

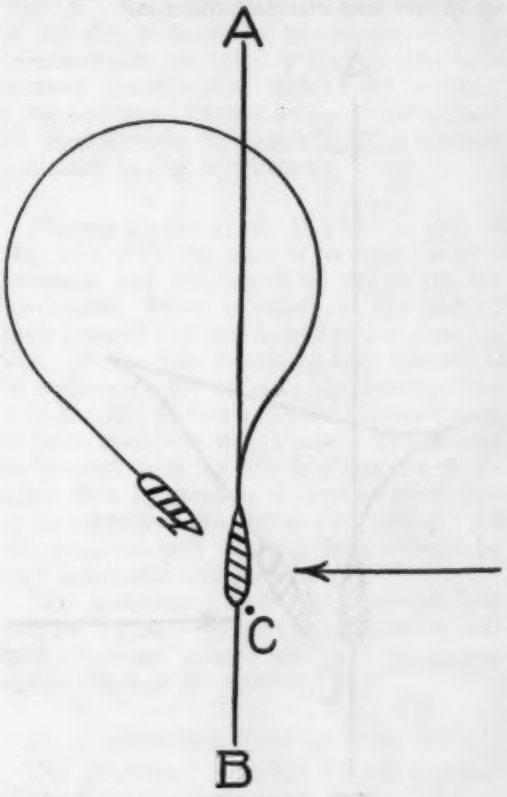


FIG. 4

By this method, on a destroyer steaming at twenty knots, the man should be picked up in seven minutes[2]; the time depends to some extent upon the force of the wind. The procedure outlined in Fig. 3 is much better because the vessel is under better control and consequently there is more probability of success.

Case D. Strong wind on starboard beam making a lee necessary for launching a boat (Fig. 4).—Destroyer steaming on course *AB*. Man overboard at *C*. Wind from the direction shown by arrow.

Hard right rudder; make a turn of 45 degrees to the right, then hard left rudder to turn as indicated in Fig. 4. Take the

man on board on the starboard side (the lifeboat side); then proceed as in Case A.

By this method, on a destroyer steaming at twenty knots, the man should be picked up in five and one-half minutes.[2]

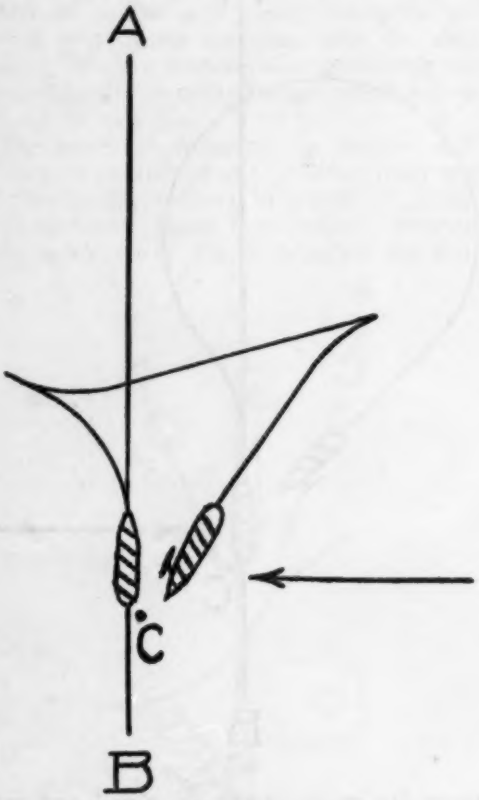


FIG. 4A

Alternate Method. Strong wind on starboard beam making a lee necessary for launching a boat (Fig. 4A).—Destroyer steaming on course *AB*, man falls overboard at *C*. Wind indicated by arrow.

Engines full speed astern; rudder hard left. When ship begins to gather sternway, shift rudder to hard right. The stern will back into the wind. When the man is sufficiently ahead of the ship to afford distance for maneuvering, go ahead and pick up the man as in the last stage of Fig. 4. Because of the strong tendency of the ship to back into the wind it may be impracticable to form a lee for the boat without considerable delay and perhaps some additional maneuvering. This method is, therefore, to be avoided. The method indicated in Fig. 4 is much better.

Case E. Strong wind on port beam making a lee necessary for launching a boat (Fig. 5).—Destroyer steaming on course *AB*. Man overboard at *C*. Wind from direction shown by arrow.

Hard right (or left) rudder, turn through 180 degrees and steady on new course. When the ship has passed the man abeam, hard right (or left) rudder and turn through 180 degrees to head directly for the man. Take the man aboard on the starboard side (the lifeboat side); then proceed as in Case A.

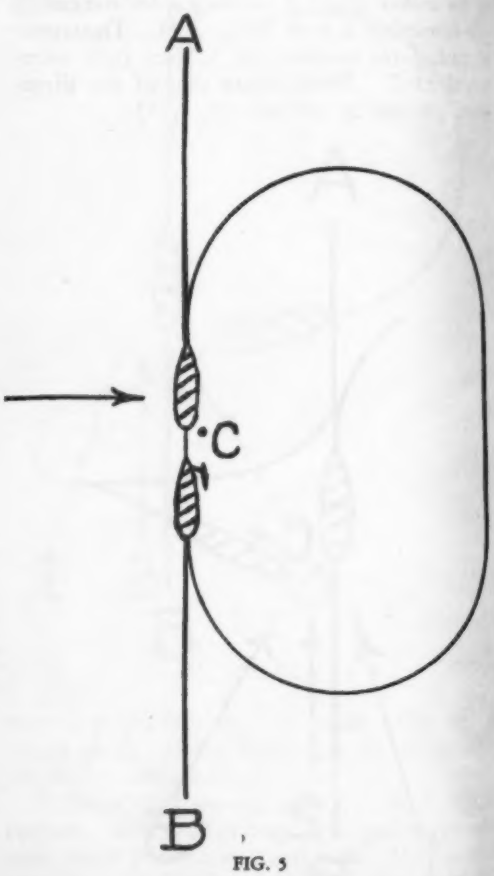


FIG. 5

By this method, on a destroyer steaming at twenty knots, the man should be picked up in six minutes.

Alternate Method. Strong wind on port beam making a lee necessary for lowering

a boat (Fig. 5A).—Destroyer steaming on course *AB*, man falls overboard at *C*. Wind as indicated by arrow.

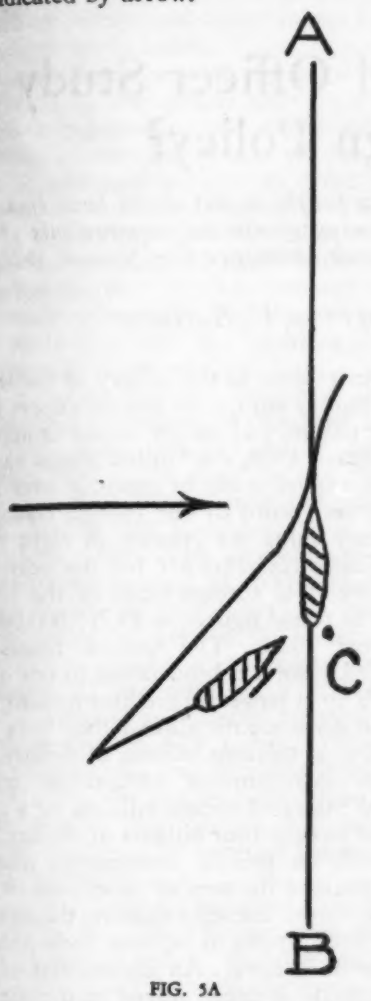


FIG. 5A

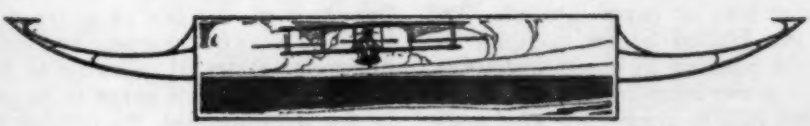
Engines full speed astern; rudder hard right. When the ship begins to gather sternway, shift the rudder to hard left. The stern will back into the wind. When the man is sufficiently far ahead of the ship to afford distance for maneuvering, go ahead and pick up the man as in the last stage of Fig. 5. Because of the strong tendency of the ship to back into the wind it may be impracticable to form a lee for the boat without considerable delay and perhaps some additional maneuvering. This method is, therefore, to be avoided. The method indicated in Fig. 5 is better.

Picking Up the Man. In order to pick up the man with the ship it is well to have grapnels and heaving lines ready on the forecastle. Have bowlines in the end of each grapnel line and in one end of heaving line. If the man is able to help himself it is necessary only to pass the heaving line with bowline to him and haul him on board. If he is unable to help himself, a man may be lowered over the side in a bowline to recover him by passing a bowline over him or by hooking a grapnel in his clothing. At sea grapnels and heaving lines should be kept handy for this purpose.

The gangway should be lowered and manned by men with boat hooks who will haul the man aboard easily if he passes within reach of the gangway.

II. Vessel Steaming in Formation

The procedure required by the *General Tactical Instructions* must be carried out. When circumstances permit, as when steaming last ship in column or when steaming in line of bearing (when turn may be made towards the advanced flank without endangering other vessels) the procedure becomes the same as for a vessel steaming independently.



Why Should *the* Naval Officer Study American Foreign Policy?

The gravest responsibilities that can come to a people in this world have come to us. We must not fail to meet them in accordance with the requirements of conscience and righteousness.—PRESIDENT COOLIDGE, *Armistice Day Speech, 1928.*

By LIEUTENANT LELAND P. LOVETTE, *U. S. Navy*

I

THE interest of the American people in foreign affairs is probably greater at the present time than at any other period in this century. This interest has been accelerated within the last year by the extensive private and official discussions arising from the Kellogg pact, the cruiser bill, and the so-called Anglo-French armament understanding. It is significant of the importance of these international and national policies that the President of the United States should with such preciseness outline the executive attitude of the government in his Armistice Day speech of 1928. Mr. Coolidge touched directly upon the post-war world order and clarified the foreign policy of the United States in such a definite manner that it was inevitable that his pronouncements should elicit all shades of foreign comment. It is of particular interest to the naval officer that, in this speech, Mr. Coolidge emphasized the interdependence of foreign policy and national defense in clear, vigorous, Rooseveltian terms.

There are fundamental reasons why the interest of the American people has quickened to the importance of things international, and there is in this connection a growing need for leadership to interpret truth without bias or party interest. The fact that the United States occupies the most eminent position in assets, resources, and political power complicates the question of policy and fails to answer the vital questions: how will this position be maintained and how will it be consolidated?

It is the opinion of experts that the United States is today the richest nation that has ever existed in the history of the world. This country enjoys the largest export trade of any nation, and stands second in imports. In October, 1928, the United States had the largest export trade in quantity ever shipped in the record of our foreign trade, and in money value the greatest in eight years. The *Statistical Abstract* for the year 1929 gives the total foreign trade of the United States in round figures as $9,219,800,000 for the year 1928. The United States has emerged from a debtor nation to one of the world's most powerful creditor nations, with private investments abroad that have been reckoned at thirteen billions of dollars, plus foreign governments' obligations to the United States of eleven billions, or a grand total of twenty-four billions of dollars. The dividends on private investments alone in 1922 attained the sum of nearly seven hundred millions. Experts estimate the assets of the United States to be over four hundred billions of dollars. An undreamed of economic strife is being waged in the markets of the world to maintain this lead in world trade and finance. The enormous business involves foreign policy and a protection of foreign policy.

President Coolidge spoke with stern reality and prophetic sense when he said that this position was one of grave responsibility. The ways of the world and the tendency of foreign states to endeavor to dictate our foreign policy seem never to be understood by the sentimentalist, the pacifist, the "vote-getter," or the "party-solidarity man." The signposts of consistent and truly just yet protective policies point to an understanding of those policies which contributed to

the attainment of the present international position of the United States. From this one gains a true perspective as to how they should be interpreted today in the light of a changed world order.

It is to the interest of the naval service, and vital to the people and government which it represents, that every effort be made to master the details of our major policies, past and present, in order that it may at all times be thoroughly informed and in a position to defeat those who endeavor by propaganda and sentimentalism to undermine that which has contributed so effectively to national greatness, and stands ever ready to protect our interests and our policies—the Army and the Navy.

In a recent popular magazine Richard Washburn Child wrote, in reference to what the then President-elect might tell the people: "He would have to say that, as things are to be for a long time, the national defense we must lean upon is our Army and Navy. The protection we need has increased because of increased foreign trade. It has increased by new needs to maintain the principles of the Monroe Doctrine, and to defend island possessions and the canal. It has increased by the shrinking of the oceans as protecting spaces, which have been shortened by speed and power of ships, submarines, and airplanes." In other words, there are grave facts to be faced if one grants that Utopia has not been reached, and national security has not been effected by promises.

There are three variable but determinant factors in the development and maintenance of foreign policy: first, the will of the people, exercised through the executive in the formulation and promulgation of a policy; second, the work of diplomacy to execute the details of furthering and consolidating, if possible, the policy; third, but not the least, is that of national defense, and in particular, the Navy in its relation to foreign policy. It is the duty of the Navy to augment the foreign service of the United States in all that pertains to the policies of peace, good will, and aid to states in national calamity, famine, or catastrophe; but there is another duty that must not be overlooked, in the field of foreign policy, and that is the protective element. The Navy must be of sufficient strength effectively to safeguard these policies in any war, and, should we be neutral, to protect the tremendous interests of the United States abroad, and the seaways of the world over which our trade is carried, from which much of the material wealth and prosperity of this country is derived.

II

Before entering into the main discussion of foreign policy and methods of its study, it might be of interest to glance briefly at the achievements of the Navy in the field of naval diplomacy. It is always with pride that we read the statement of Secretary of State John Hay to Rear Admiral Chadwick, president of the U. S. Naval War College in 1904: "We have had a number of difficult international situations in the West Indies and in Venezuela in the last two years, and they have all been handled by naval officers very well—they have not made a single mistake."

The officers of the Navy and the students of foreign affairs have not forgotten the work of Jones, Kearney, Perry, Schufeldt, and Bristol, not to mention the many isolated cases of other officers, in the broad and important field of sea diplomacy. No study of American foreign policy is complete without a study of Jones's activities ashore in Europe during the period of and just after the American Revolution. In a study of treaties, it is well to remember the part played by naval officers in the negotiations with the Barbary States, the first treaty with Turkey, the opening of Japan by treaty, the first treaties with Japan and Korea, and the commercial advantages gained by the prompt action of a naval officer in effecting our first treaty with China.

A careful study of the above negotiations will show that, although in most cases these naval officers had instructions, they were in no sense complete. Knowledge of our government's policy and most important, also, that of other states, enabled them to make accurate diplomatic decisions that will ever stand to their credit.

A scholarly diplomat once defined diplomacy as, "the application of intelligence and tact to the conduct of official relations between the governments of independent states, extending sometimes to their relations with vassal states." In other words, it is a system or an official method by which international relations are furthered, com-

merce extended and maintained abroad, and the nation's policies promulgated in foreign lands. It is scarcely disputable that the naval profession and the diplomatic corps reflect the foreign policy of the government and should work hand in hand for the best interests of the state.

It is interesting to note that, in the past achievements of the Navy in diplomacy, although there was naval force in most of these instances at the command of the negotiator, it was not used. This power, of course, in some instances had a certain effect, but in the main, these treaties were effected by moral suasion and the just argument of reciprocal advantages to be gained by the contracting parties. Here the point is stressed that it is to the interest of the naval officer and of the government that the officer keep in mind the broad outline of current governmental policy, and the principles upon which it was constructed. A close study will disclose a certain distinction between the theoretical and the actual policy of governments in the conduct of foreign relations.

The naval officer makes no pretense to be an official spokesman of his country, nor does he desire to usurp the important duties of officers of the Department of State. There is sufficient work for all, and cooperation must be the aim.

The naval officer should be cognizant of the foreign policies of the government to such a degree that he will comprehend the full intent of the government, and be guided accordingly. This comprehension is particularly necessary if the officer hopes to gain the reaction that our policies have upon the thought and opinion of other states, and particularly their attitude as to the national defense policy of the United States, and its relation to our commercial policies abroad. In this respect America's policy, past and present, should be thoroughly understood in order that the estimate of the international situation may be accurate and well founded. The need for such knowledge increases proportionately with the United States' advance in wealth and political position. The naval officer should acquire this knowledge for the same purpose as he does that pertaining to strategy and tactics—necessary information that equips the individual to master situations confronted, and meet emergencies armed with precedent and fact.

This study further leads to a conciseness and clarity in reports of a political or diplomatic nature. Reports, whether they be good ones or bad ones, are those statements which allow the senior, afloat or ashore, to see the situation through the eyes of the officer "on the spot," or in the locality. It is the faithful attention to details, and the correct assumptions upon which reports are based, that give to them their much-to-be-desired value when read afar. The attention must ever be directed to the eddies and counter currents of foreign policy, for here are to be found the fine points and ofttimes the vital ones. The sensibility of historical cause and effect touches these subtle factors in foreign affairs and should be kept in mind by the student.

Naval diplomacy and foreign relations are history, but one cannot say that all history consists of foreign policies and diplomacy, for nearly every other page of history is that of war. The lessons of history should have a twofold value for the naval officer. We learn not only why countries go to war over a conflict of policy, but we learn how and by what methods they wage it. This method of historical research as regards sea power reached its zenith in this century by the publication of the brilliant and illuminating studies of Admiral Mahan. His works should be used as standard references in the study of the fusion of foreign policy and national defense, and bring home to the student the influence of sea power and its relation to the destiny of a state. Mahan dealt with facts and realities, and what is more, how powers shaped their sea policies dependent upon their strength and interests, without the dictation of other powers. There are supreme facts in history which a naval officer cannot intelligently ignore. This is especially true at the present time when realities are often forgotten in the chase of the ideal, and an utter forgetfulness of those events and policies by which our national greatness, solidarity, and prosperity were effected.

History will teach the careful student how hatred, greed, lust for power, material wealth, and militaristic tendencies have served as the progenitors for war. We shall learn to differentiate between an asservation of good intentions and the ultimate actions

of many nations which made the declaration. In other words, we shall see history as it is, and learn from these fundamental facts of human existence. Mowrer, in a recent study of our foreign affairs, said:

> Forasmuch as human character shows very little evidence of modification in the last four thousand years, one may reasonably suppose that, to given causes, men may continue, in the bulk, to respond by similar reactions, so that for statesmen history teems with revealing instances, the lessons of which are applicable daily. Europe may know too much history; but we do not know enough. By giving a little more heed to the past, both of ourselves and others, we shall come into a better and kindlier understanding of the present—of those things which, regarded in the soft glow of retrospection, seem possible to be attempted with success, and of those which do not.

History will teach us that the course of a world state is beset with many dangers, charted and uncharted. It will teach us that ponderable and imponderable factors enter into the situation, but we may make note of one certain fact that world prestige and predominant world trade have never lasted long without adequate protection. It is the way of the world.

In advance of our consideration of a method of study and a general outline of foreign policy, it is fitting that there be inserted at this point a few general conclusions. It it true that they might be called generalizations; nevertheless it has been my aim to arrive at some conclusion, if for no other purpose than that of crystallizing an opinion of the facts in the case. They are offered with considerable trepidation, and with the sole claim that they result from some years' study of the treaties and foreign relations of the United States. If there be discerned a faint trace of pessimism, or a note of disillusionment, it may be attributed to a "debunking" of platitude, and the office-seeker's interpretation of foreign policy. I read, as a boy, in a standard history, that the Americans won the battle of Yorktown and drove the hated Redcoats from the United States. It was later that I learned of our debt to France, for in that battle they furnished 7,000 men or well over half of the land troops, and the Comte de Grasse had 23,687 officers and men in the blockade force at sea. The British children still read, in all probability, of the story that was in their early readers telling of the day when the Indian Rajah asked the beloved Victoria how she accounted for the extent and size of her great empire. The story goes that the august Empress, looking at the Rajah, slowly extended her arm and laid her hand on the Bible. The point is here made, that without a study of official correspondence, documents, treaties, and the contemporaneous events, both political and social, one will never gain the true perspective of foreign policies and international relations.

General Observations

1. In general a government's foreign policy is dictated by national interests.
2. No nation or group of nations in coalition has ever had a lease on world morality.
3. The United States realized early in its history that it was better to look carefully after her own interests than to have others do it for her.
4. Might has never made right; but edicts and policies derive the great measure of their force from the power behind them.
5. The rule of give and take applies in general to diplomatic transactions.
6. There are few cases in history where a country did "the giving" actuated solely by idealistic motives. The Washington Limitation of Armaments Conference very nearly approached that.
7. The United States, in the early days, considered the policy of isolation as the only rational doctrine that would lead to a strong sovereign state. There is a question as to whether or not this is applicable today.
8. Washington never used the expression "entangling alliances with none." He did say: "Taking care always to keep ourselves by suitable establishments on a respectable defensive posture, we may safely trust to temporary alliances for extraordinary circumstances."
9. An equitable and just balance of power is one of the world's greatest stabilizing influences.
10. The principles of democracy have spread to practically all parts of the world, but its ultimate success depends more and more upon the political education and enlightened viewpoints of the masses.
11. Real leaders are needed as never before to instruct the people as to the great issues at stake. That profound student of government, Bryce, remarked: "Even lead-

ing statesmen are often strangely ignorant of European diplomacy, much more so, the average senator or congressman." Admiral Mahan wrote: "I apprehend, that nowhere does the separation between the coördinate branches of our government operate more disastrously than in the sphere of foreign relations; for this is the subject from which the average congressman most easily releases his conscience, because it is of the least interest to his constituents and its importance has not come home to his own consciousness." Henry Adams, speaking in the third person, said: "What he insists upon is only that, in domestic politics, every one works for an immediate object, commonly for some private job, and invariably in a near horizon, while in foreign affairs the outlook is far ahead, over a field as wide as the world." There are indications of a quickened interest in foreign affairs in the legislative branch of the government.

12. A history of the governmental policy in the territorial expansion of the United States will show on close inspection that there are spots where the highest standards of international ethics did not obtain.

13. Certain great doctrines such as those of expatriation and arbitration are essentially American, and are lofty contributions to the long history of international relations.

14. Roosevelt's pronouncement, "The Monroe Doctrine is as strong as the Navy and no stronger," might equally be applied to the event of a war in which the United States was neutral, that the sea-borne trade of this country will be carried on in proportion to the strength of the Navy.

15. When diplomacy becomes bankrupt, war begins.

16. It is exceedingly doubtful that the Colonies could have won the Revolutionary War without the aid of France and the terms of the Franco-American Alliance.

17. France gave material aid to the American cause in order to weaken Great Britain and reëstablish the balance of power in Europe.

18. The War of 1812 was fought principally over the issues of neutral rights and impressment of seamen; yet the subsequent Treaty of Ghent scarcely mentioned any of the subjects over which the war was fought. Many writers hold that Great Britain held to the principle of impressment until 1861, when she registered a vigorous protest over the removal of Mason and Slidell from a British steamer.

19. Sea power has for three hundred years been the chief factor of protection and maintenance of the foreign policies of the powers of the world.

20. Maritime law in war and neutral rights are at present in dire need of interpretation and codification by international agreement.

21. Until there is a Utopian world state, positive security and absolute disarmament are incompatible.

22. The social and economic tendencies of all states determine to a great degree what self-interest will actuate their respective policies towards other states.

23. In times of peace, the equilibrium of states rests upon faith. The desire to strengthen this faith should be in the hearts of all men; but until the millennium is reached, force must protect those who keep faith from those who break faith.

24. The Navy of the United States has, in all of its country's conflicts, been of inestimable value. It has in time of peace reflected the American-born doctrines of arbitration, "the open door" in commerce, and to a degree unsurpassed by any navy in the world, rendered prompt and effective aid to humanity in distress because of catastrophe and disaster.

25. It should be the duty as well as the pride of every true American to insist that our Navy should never by any circumstance fall below parity with another power; the most positive guaranty for peace we can ever hope to secure until the millennium or a *Pax Romana* is "a navy second to none."

IV

The traditional policies of the United States are those agents that have contributed directly to the attainment of our place in the family of nations. They might be called the sinews and steel of our international relations. There were definite causes that brought them into being. The student must look for causes in order to fully comprehend effect. In a study of foreign affairs, we must gain the spirit, as well as the letter of the doctrines, policies, and pronouncements of our government. The motives that actuated policies are to be understood in the light of their day, but the

principles of justice and equity they contain are applicable today and tomorrow, and constitute what might be termed the essence of Americanism.

There are certain phases of our national life, as well as doctrines applicable abroad, that, when properly studied, will give the full picture. It is for this purpose that there are set forth below topics for study. The outline is not complete in detail, but it should have some value in tracing the attitude of the government from its humble beginning until the present day. In spite of the writings of many so-called "liberals" that we never had a foreign policy, one will observe a certain consistency and continuity, even a persistency, in the maintenance of certain American principles.

Topics for Study

1. The practical achievement of the Anglo-Saxon race in working out the principles of self-government.
2. The principles and doctrines gained from the French political and philosophical writers of the seventeenth and eighteenth centuries, and their influence upon the minds of the fathers of our government.
3. The foreign policy of the United States from July 4, 1776, to March 4, 1789.
4. The territorial expansion of the United States, with attention to foreign meddling, the slavery issue, the so-called "land hunger" of the settlers, and what Roosevelt called "the winning of the West."
5. The American doctrine of nonintervention, and the Monroe Doctrine.
6. The American doctrine of citizenship and expatriation.
7. The freedom of the seas, and neutral rights.
8. The doctrine of commercial freedom and equal opportunity, often called the "open-door policy."
9. The pacific settlement of international disputes.
10. A history of the relation of the United States to the Latin-American states, with the attendant doctrine of Pan-Americanism.
11. The attitude of the United States towards international coöperation and organization.
12. The policy of the United States in regard to limitation of armaments.
13. A study of the Caribbean policy of the United States.

Conjecture as to the "inscrutable destiny" of the United States cannot be dismissed as wasted effort. Those policies and doctrines which we have just enumerated were formulated with wisdom and foresight. They looked to the future, not as the average politician to the next election, but as the real statesman looks—to the next and future generations. The greater part of the above policies and doctrines are pertinent to the well-being of the United States. The student will recognize in some of them the principles upon which all future policy might well be constructed. It has been necessary, in the past, to employ force to defend and protect some of these American principles. Can we safely argue that by signing papers, such violations will never occur again?

V

There should be a method of study of these topics. It is suggested that a period of time be devoted to the study of one topic, rather than an attempt to cover several at the same time. The subject should be covered from its inception, with due weight given to those factors that gave rise to its need of formulation or promulgation. This seems to be the only method by which a thorough knowledge of our basic doctrines may be satisfactorily grasped. The truth is the aim of all study and although in a subject such as this, there will be found a divergence of opinion on ethical or juridical grounds, even among the leading authorities, it is, nevertheless, inexcusable for a naval officer to be unacquainted with the facts. It is the duty of all government officials to know the orders, instructions, and the compromises that have determined our course on the rough sea of foreign affairs.

I have taken the Monroe Doctrine as an illustration for the method spoken of above. It is an outline of a method of study but no claim is made that it is *the* method.

A Study of the Monroe Doctrine

1. A study of the United States' first treaty—that of alliance with France. This significant treaty, without which it is hardly possible that the United States would have gained independence, had in it a striking clause, which stipulated that France re-

nounced "forever the possession of the islands of the Bermudas, as well as any part of the continent of North America, which before the treaty of Paris in 1763, or in virtue of that treaty, were acknowledged to belong to the Crown of Great Britain." The sagacity of the fathers, coupled with the astute diplomacy of Franklin, is seen in this treaty to have given thought to what eventually materialized in the slogan, "America for the Americans." Some authorities hold that this marks the beginning of the Monroe Doctrine. There is no doubt that this stipulation clearly shows that the United States cared for none of the great powers of Europe as near neighbors, even though they were allies, as in the case of France.

2. A study of the liberation of the Spanish colonies in Central and South America. Did the liberal tendencies of the United States affect them?

Why did the recognition of these colonies reach a political issue in the United States?

Why did the Spanish government delay ratification of the Florida Treaty?

What caused Spain to refrain from lending aid to the American cause although an ally of France? Read some of the correspondence of Talleyrand to the Spanish minister of foreign affairs.

3. A study of the high spots of British policy in regard to overseas trade and neutral rights during and after the Napoleonic wars.

In the subsequent treaties of the states of the "reactionary" continent, why did England oppose any acquisition by France of the Spanish colonies in the New World?

4. A study of the correspondence relative to the British proposal through Mr. Rush, the American minister in London.

5. A study of the comment made by Monroe, Jefferson, and Madison on the British proposal in contrast to the opinion of Clay and Adams.

In this connection Latané writes: "After our entrance in the great world conflict, several writers raised the question as to whether the three elder statesmen were not right, and Adams and Clay wrong. If the United States and England had come out in favor of a general declaration against interventions in the concerns of small states, and established it as a world-wide principle, the course of human history during the next century might have been very different, but Adams' diary does not tell the whole story."

6. Why was the British government so desirous of pressing an understanding with the United States in regard to the Spanish colonies?

Canning wrote: "If the United States acceded to such views, a declaration to that effect on their part, concurrently with England, would be the most effectual and least offensive mode of making known their joint disapprobation of contrary projects. . . ."

7. An analysis of Monroe's Message to Congress on December 2, 1823.

What other principle was combined with Canning's suggestion?

How was this message received in England and on the Continent?

Would the Monroe Doctrine have been effective without England's implied acquiescence to oppose the proposed action of the Holy Alliance?

Canning's official correspondence throws much light upon the European attitude and particularly that of Great Britain when, in a speech of December 12, 1826, he said: "I looked another way—I sought for compensation in another hemisphere. Contemplating Spain, such as our ancestors had known her, I resolved that, if France had Spain, it should not be Spain with the Indies. I called the New World into existence to redress the balance of the old."

8. A study of the powerful effect that sea power has on the maintenance of this doctrine.

How did the balance of power in Europe affect the situation?

The incidents wherein American sea power exerted an influence.

9. A study of the violation of the spirit and the word of the Monroe Doctrine.

How and for what reason did Great Britain acquire the Falkland Islands and British Honduras?

What powers backed, and for what purpose, Maximilian's ill-starred attempt to set up an empire in Mexico?

What was the purpose of the British and French negotiations with Texas before that state was annexed? How was the delayed annexation treaty of Texas hastened to ratification by the information of the foreign interests in Texas?

Did the Monroe Doctrine cause Great

Britain to desist in her effort to occupy California in 1844, or were there other reasons?

10. A study of the Monroe Doctrine, as it is understood at the present time.

How does it affect the relations of the United States with the other American states?

Is there any reason why certain interpretations of this basic policy should offend the sensibilities of the other American states?

What is the significance of Sir Austen Chamberlain's official statement to the United States before signing the Kellogg pact, in which he said:

> The language of Article I, as to the renunciation of war as an instrument of national policy, renders it desirable that I should remind your excellency, that there are certain regions of the world, the welfare and integrity of which constitute a special and vital interest for our peace and safety. His Majesty's Government have been at pains to make it clear in the past that interference with these regions cannot be suffered. Their protection against attack is to the British Empire a measure of self-defense. It must be clearly understood that His Majesty's Government in Great Britain accept the new treaty upon the distinct understanding that it does not prejudice their freedom of action in this respect. The Government of the United States have comparable interests any disregard of which by a foreign power they have declared that they would regard as an unfriendly act. His Majesty's Government believe, therefore, that in defining their position they are expressing the intention and meaning of the United States Government.

The above was quoted in order to show the recognition accorded this doctrine by another power. There is considerable debate in the United States as to whether or not our position is made clear in the Kellogg pact as signed at Paris. There should be nothing left to implication in such a comprehensive asservation.

The above outline gives a general idea of the ramifications of this important American doctrine. The application of its principles has not always been consistent. Nevertheless there is a marked thread of purpose throughout its long history and, although it has stretched at times to the right and to the left, and in several instances been nearly broken, it must be granted that the United States has in the main preserved the essence of this vital policy.

A reasonable study of our foreign affairs will impress the student with one irrefutable fact, and that is, that the strength of some of these policies is derived from the strength of our national defense. It is for the best interest of the United States that these policies be maintained, and further, that the United States make every effort to maintain the peace. War is national or international sickness, and peace is the good health of a state. The surest and the least expensive way in the final analysis to preserve the good health of the state is to provide adequate defense for the tremendous assets and foreign investments involved. American foreign policies will dictate that this Navy be one of good will and friendship and fully able to protect the nation's legitimate possessions.

President Coolidge said in his Armistice Day speech of 1928: "It is our duty to ourselves and to the cause of civilization, to the preservation of domestic tranquillity, to our orderly and lawful relations with foreign peoples, to maintain an adequate Army and Navy." In support of this most definitive pronouncement of our Chief Executive, it should be the duty of the naval officer to ever fully understand what policies are pertinent to "our orderly and lawful relations with foreign peoples." They are studies that will lead to clear vision in all that relates to our international duties and responsibilities. The knowledge is necessary to combat parlor and pulpit pacificism. They are the facts in the case.

President Coolidge gave words of wisdom to all who have dealings with foreign states and peoples when he said: "It is befitting that we should pursue our course without exultation, with due humility, and with due gratitude for the important contributions of the more ancient nations which have helped to make possible our present progress and our future hope." It is well to remember that the greatest diplomats and statesmen were those who understood that there were two sides to all questions, and that polite respect for other points of view tends toward dignified compromise and arbitration. We shall learn more of this in a study of our treaties.

A survey of the boundless field of foreign affairs should impress the naval officer with the professional value of such study. It will take but casual research to learn that great proficiency was reached in like studies

by the officers of Spain, France, and Great Britain when those states were consolidating their powers and possessions. It is a just goal that each and every officer should endeavor to understand and to reflect the best that has been thought and practiced in our foreign relations. Each officer commences his career with a future consecrated to duty and national service, and by virtue of this initial advantage, he is in an enviable position to observe and to study the dangers that confront the state from afar.

The question of how we shall conduct ourselves as a world state is foremost in the thoughts of those who think in terms of foreign affairs. A true and intelligent understanding of the problems of the present and the future is scarcely possible without acquaintance with the policies formulated in our past history. The organized efforts of various groups to defeat the Navy legislation indicate that some of the supreme lessons of our history have been forgotten. They seem to forget that were it not for national defense there would be no United States as we know it. They forget the assets liable to be jeopardized.

Mankind wonders as never before "how far towards the millennium of human brotherhood can he advance with safety." The solution is the supreme problem of modern civilization. A short cut does not seem to have appeared. To cast off our surest safeguard for peace can only invite disaster.

One asks again, why should the naval officer study foreign policy?

1. It is joined to our profession in its higher aspects, and is a determinant of the amount of national defense necessary to protect the interests involved.

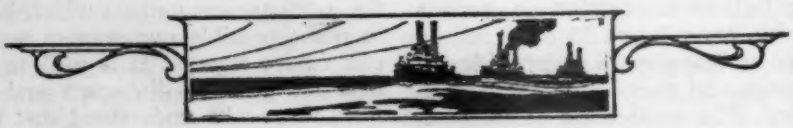
2. It enables the officer clearly to understand how policy and defense shaped the course of our country from thirteen weak colonies to a world power.

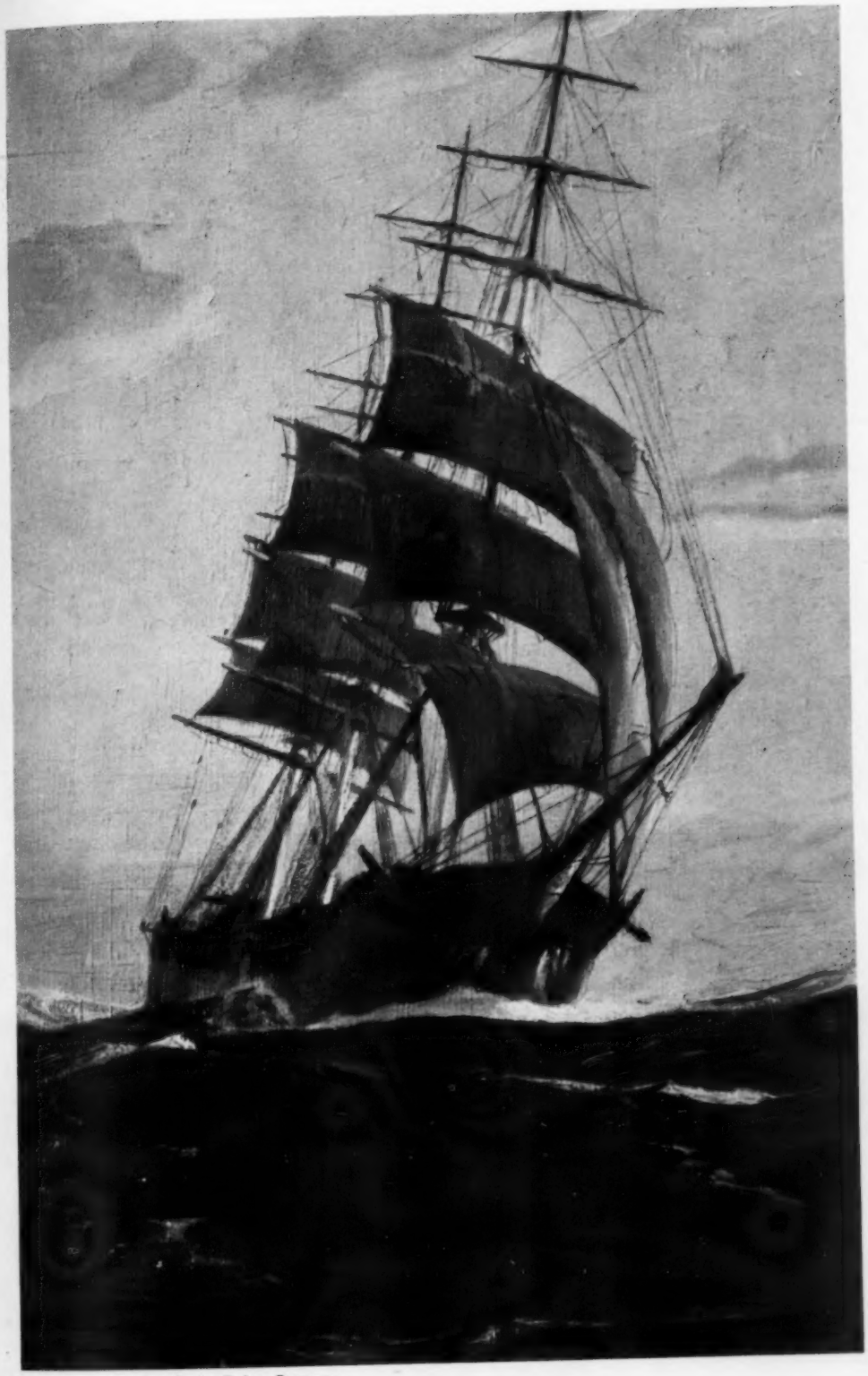
3. It will give the officer a definite conception of the problems that confront us as a world state and why certain doctrines are essential to our well-being.

4. It will impress upon the officer the fact that the Navy's mission is founded upon the protection of certain specific policies.

5. It is truly a study of inspirational value, and will make of the officer a better American.

6. It will tend to create a mental attitude relative to our contacts with other states, whereby firmness without insolence, and amiability without weakness, will become the guiding rule.





From a painting by Charles Robert Patterson

A NOVA SCOTIA SHIP OF THE EIGHTIES

International News Photos, Inc.

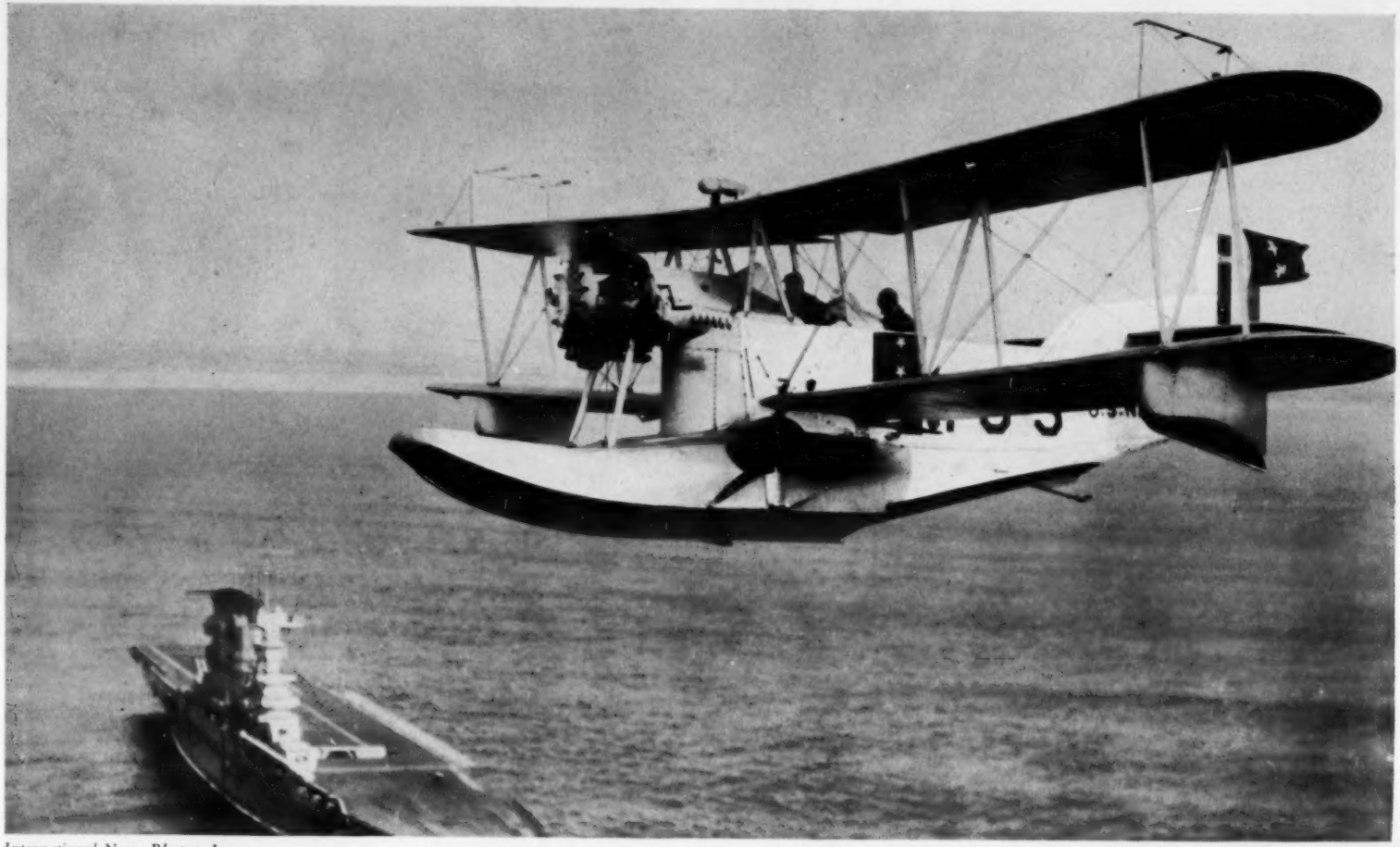
A PLANE THAT CAN'T TURN OVER?

This plane is equipped with the new style Foche-Wulf wings, which are causing something of a sensation in German flying circles. The wings are said to make it impossible for the plane to turn over under any conditions. Pilot von Koeppen recently made several test flights and reported that his repeated efforts to turn the craft over were futile.

International News Photos, Inc.

SINGLE-SEATER FIGHTER-TYPE *JAKTFALK*

Sweden develops new type Army pursuit plane. Single-seater, staggered combat plane *Jaktfalk*, with a 500-horsepower engine, built by the Swedish Aëro Company.



International News Photos, Inc.

FLAGSHIP OF AIR NAVY OVER U.S.S. *LEXINGTON*

This Wasp-powered amphibian plane is for the use of Rear Admiral H. V. Butler during the 16,000-mile cruise which began February 15. Below may be seen the *Lexington* which, with the *Saratoga*, carries six Wasp-powered Boeing fighters, twelve Wasp-powered Vought Corsairs, and eighteen Hornet-powered bombers each. These air forces will engage in "major offensives" against the scouting fleet in Atlantic and Pacific waters before returning to San Diego June 21.

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International News Photos, Inc.

THROUGH THE GATES OF LONDON ON THE TRAIL OF ADVENTURE

This striking picture of historic Tower Bridge, which spans the Thames between two of London's busiest communities, shows the middle section of the structure being lifted to permit the royal research ship *Discovery III* to pass on its way to the Antarctic, where three years will be spent in research. The picturesque old bridge marks the entrance to one of the most crowded stretches of the river and its lofty towers are a source of constant admiration by American visitors.

Courtesy Columbian Rope Company *From a painting by Charles Robert Patterson*

SUNRISE ON THE GRAND BANKS

The picture shows a scene that was common enough twenty or thirty years ago, but which will probably never be seen again. Such is progress, and the tragedy of it is that the square-rigged sailing ship, man's most beautiful creation, reached its highest point of development just when it was doomed to be laid aside.

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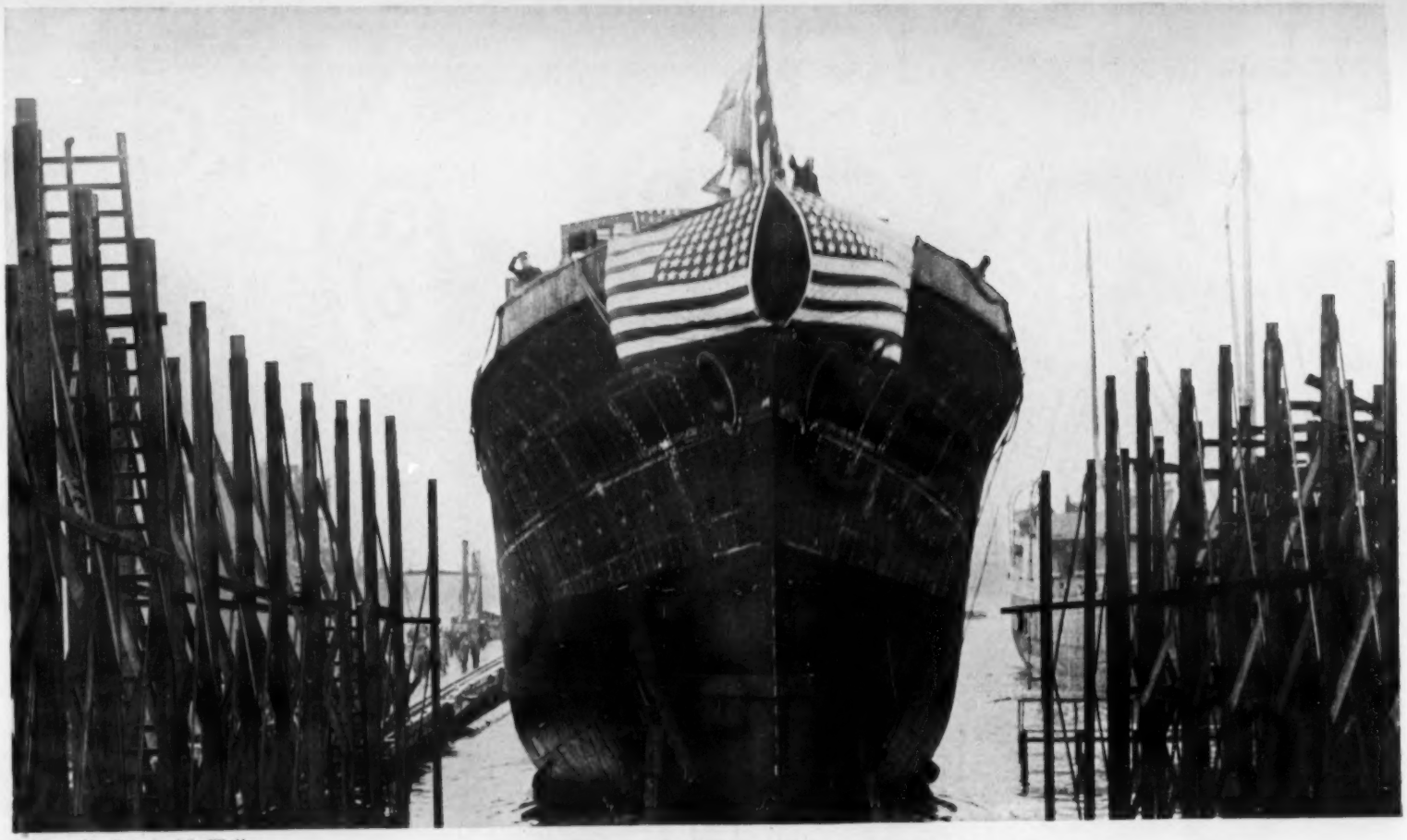


UNIV. OF MICH.

Courtesy Mr. Raymond J. Walker

THE NEW UNITED STATES COAST GUARD CUTTER *SEBAGO*

This, the second of the four Coast Guard cutters being built at the General Engineering & Dry Dock Company, Oakland, Calif., is shown leaving the ways.

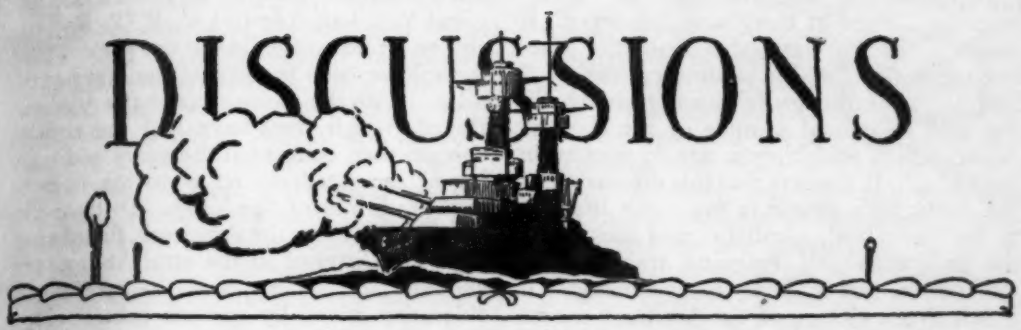
Courtesy Lieutenant Commander John A. Gade, U. S. Naval Reserve

THREE AMERICAN NAVAL ATTACHÉS

Left to right: J. C. Colwell, London; W. S. Sims, Paris; A. P. Niblack, Berlin.

This photograph of a board ordered to investigate and report on a new system of submerged torpedo tubes built and installed by Armstrong and Company, Newcastle-on-Tyne, in a new Norwegian armor clad, was taken in Christiania, February, 1898. The photograph was presented by the officers to Lieutenant Commander Gade's father, who was at the time American consul general in Norway.

DISCUSSIONS



The College, the Technical School and the Naval Academy

(See page 123, February, 1930, PROCEEDINGS)

CAPTAIN WILBUR R. VAN AUKEN, *U. S. Navy.*—Commander Rossell is to be congratulated upon introducing some new ideas on the Naval Academy for open discussion in the Naval Institute. It is seldom nowadays that an article appears in the PROCEEDINGS which is subject to such controversy. There is, however, never a "closed season" upon the Academy. As many graduates say, "The Navy school is not what it used to be when I was there." Every graduate of the Academy, and in fact all officers of the Navy, are always interested in what the Academy is doing, and how everything is coming along. There is probably no institution in America where graduates keep in as close touch with their Alma Mater, or are in a profession where they are working and living with fellow graduates, as we do in the Navy. And it is to the credit of the Navy and the Academy to know that sons of graduates, and sons of officers who came into the Navy during the War, are "Navy Juniors." The lieutenants', ensigns' and midshipmen's lists probably show more sons of officers today than at any other time in the Navy's history. That these college graduates, and others who are in the various branches of the Navy, think so highly of the Naval Academy is a great tribute.

There are certain statements in this article and deductions with which the writer disagrees. In the first place, it is believed that the very excellent table of entrance requirements compiled gives an erroneous impression. While it is true that a candidate enters the other institutions in somewhat the same manner as he does the Academy, it is also a fact that practically *no* candidates can pass the examinations to any of the other institutions who have *not* graduated from a high school of high standing. This is not so at the Naval Academy. Candidates have for years, and are now, still entering the Academy in many instances who have had only two years of high school, and not a very good high school at that. The writer feels safe in stating that an average of three years in high school of the enlisted men going to the Naval Academy Preparatory Classes and passing is a good average. Based upon this, therefore, I take issue with the statement, "On the whole it appears that incoming midshipmen are at least as well prepared academically as the rank and file of students starting in as freshmen at colleges or technical schools."

On the subject of physical condition, the writer believes that those who enter the Naval Academy are infinitely superior physically to those entering other colleges and universities. It goes without saying that the improvement in intramural athletics and highly competent supervison by expert trainers and coaches leave little to be desired.

Under the subject of "Character of Course at College of Arts and Sciences," it is believed that colleges are far from being standardized as to their curricula and requirements. From observation of institutions for the Reserve Officers' Training Corps, namely Harvard, Yale, Northwestern, and Georgia Institute of Technology, it is felt that each of these institutions has a different curriculum and different system, and works along lines which are not comparable. At the same time, however, the graduates of each institution scatter throughout the country and achieve eminent results.

In connection with the study of "Character of Course at the Naval Academy," it seems a little far-fetched to class the practice cruises as "major laboratory sessions," and speak of the professional training "in the light of mental attitude of the class of 'labor' which midshipmen are to control in later life." It appears that this discussion of the Academy's course is too much inclined to be theoretical, idealistic, and lacking in the perspective of seagoing training, sea experience, and training for command. It is felt that a picture of the Academy course and training from the point of view of the shoregoing officer or college authorities is not fair to the spirit and sea traditions of the Naval Academy. In the writer's opinion there is a great tendency to get away from the mission of the Naval Academy to train naval officers of the line.

Under the subject "Trends in Higher Education," the author says that engineers have now got to be broader gauge men as turned out of technical schools. In speaking of "broader gauge" it is believed that this refers to leadership, management, and big administration. Even though this is for civil life, the fundamental principles of leadership of the Army and Navy are being applied today in many cases of ex-officers who are broader gauge men than the narrow engineers formerly turned out. And it certainly is true that the "broad gauge" engineers are occupying higher salaried positions in the big corporations than the brilliant, technical, specialized engineers who have gone along in a certain groove throughout their careers. That the technical schools are changing their system somewhat tends to show that it is coming along toward that which has been at the Academy for fifty or more years—the training for command.

As to what has been happening at the Naval Academy for the past twenty-five years, there is no doubt but that each administration and academic board has been improving, reconstructing, and building on the great organization which has always existed there. With the change of times and methods, there have been drastic changes at the Academy. It is believed that the superintendents and academic boards, composed of seagoing officers in the main, have been true to their trust. A glance at the history of the Academy since the Civil War cannot but bring out the fact that under such superintendents as Admiral David Porter, Admiral Worden, Admiral C. R. P. Rodgers, and so on down the line to the present time, there have been leaders of the Navy at the helm. With their assistants on the Academic Board, which they have had the right to choose, they conserved the years and training at the Academy so as to maintain the high traditions of the Navy. To those who have not sat in on the Academic Board meetings, and listened to the straight-from-the-shoulder discussions, and the careful consideration given by various subcommittees to problems, it would be a revelation to know that the decision of this board on any subject is probably for the best interests of the service. There can be no doubt that many of its recommendations have been criticised, but very few changes have been introduced of an important nature which have later gone into the discard. In this connection, as a matter of interest, the numbers on the active and retired lists, Navy Register of January 1, 1929, who have taken an active part in directing the Academy's policies is rather enlightening. On the rear admirals' list there are two who have been superintendents, four commandants, thirteen members of the Academic Board, and twenty-six who at one time or another were instructors. This, therefore, is a total of forty-five out of fifty-seven on the rear admirals' list. On the captains' list there are three who have been commandants, thirty-five who have been members of the Academic Board, and approximately ninety-nine who have been instructors. These figures are from memory in consulting the list, and represent the minimum number. It is possible that all have not been counted, and without attempting to take the exact number of commanders, it is estimated that approximately one-third of the present commanders' list have been, at one time or another, instructors.

On the retired list there are five rear admirals who have been superintendents, seven who have been commandants, and three who have been members of the Academic Board.

It is thus seen that a fair cross section of the line of the Navy have, in the past thirty years, been directing the policies of the Naval Academy. It is believed that at all times they have carefully observed the reaction of the forces afloat to the new gradu-

ate. They have constantly received criticism from officers of the fleet and Department, and from parents of midshipmen. They have also had the advice of many eminent educators, business men, and representatives in public life on the Board of Visitors as to the needs of the Academy. The action on these recommendations has been delayed somewhat until money or more officers were available for duty at the Naval Academy. But it is only fair to say of those in authority, who worked unceasingly to improve conditions at the Academy in the past, that they were strong enough to take criticism, consider it, and act upon it if necessary.

In penning this discussion, Morro Castle entrance at Santiago, Cuba, lies in the setting sun to remind me of those who led our fleet in its first major engagement. Our graduates were *there!* As to whether the graduates are better informed technically or not, and whether they are wiser and better balanced, is a difficult question to answer. Of course, they are better informed technically than twenty-five years ago because there have been tremendous advances made. However, it must not be forgotten that in the realm of science and engineering there stand out graduates such as Michelson, Sprague, McFarland, Emmet, Cooley, Hollis, and Durand, who achieved notable distinction in civil life. And of these graduates of years ago we must not forget that, as midshipmen, there left the walls of our Alma Mater such other men as Luce and Alfred Mahan of War College fame; Robert M. Thompson, successful in business and always thinking of the Academy; John W. Weeks and Curtis D. Wilbur, who held the portfolios of Secretary of War and Secretary of the Navy in the same cabinet; H. G. Smith, Homer Ferguson, and J. W. Powell, leaders of the shipbuilding industry; and Winston Churchill, the author. These, and many others now coming along, got "their fundamentals and inspiration" after passing through the "Old Main Gate." And in the Navy it would be difficult to pass through the graduates' list and not remember what technical advancement was made in engineering, ordnance, radio, and aëronautics by so many distinguished naval officers who graduated in the 70's, 80's, and 90's. Their imagination, foresight, enthusiasm, ability, and energy brought to the Navy its present battleship engine installations, hulls, ordnance, electrical devices, including radio, aëronautical design, and fire control of today. It is therefore seen that while the course may have been elementary years ago, it must have had enough fundamentals to train men who stood well up in the front rank of civil life and the naval profession.

As to the course in ordnance and gunnery, there was no fire control, in its present sense, until about twenty years ago. And the present stage of gunnery, gun-mount development, and one might say modern ordnance and gunnery, was in its modern beginning about twenty-five years ago. However, looking over the list of graduates of the 70's, 80's, and 90's, there is no doubt that some of the greatest brains in powder, steel, and mount design came from these periods. It is further believed that then there was more attention paid to the fundamentals of ballistics, elastic strength of the guns, chance and probability of gunfire, than there has been since. The course in ordnance and gunnery has been constantly changed to meet the advancing conditions afloat and the modern devices of the Bureau of Ordnance. However, the writer believes that there is not the time in the course today for the midshipmen to get at the fundamentals of ordnance and gunnery that there was thirty to forty years ago. In view of the more or less standardization of gun design, range tables, and the limitation of guns and velocities, it is perhaps unnecessary for the average midshipman to have as great a knowledge of this as before. In fact, there is not time now to handle all of the details of ordnance and fire control that there used to be. In the fleet, however, there is no doubt that the young ensign and lieutenant is confronted with far more responsible ordnance and gunnery duties than he was a quarter of a century past. And the present advanced gunnery exercises of the fleet, where the important duties are performed in the main by young officers, are certainly demanding a greater skill and judgment. And the younger officers in gunnery today are producing such results as to be a credit to the Academy and themselves. The graduate of today *is expected* to know as much about gunnery officer of a ship of twenty years ago.

As to the liberalization of the Academy course, it has been generally recognized that

a four-year course at the Academy is all that the service can afford to give midshipmen. Many times there have been arguments for five and six years, but there have been so many things against this arrangement that this scheme appears to be out of the question. On the other hand, the Pye-Knox-King Board of 1919 recognized this fact, and recommended the General Line Course. That the General Line Course was not adopted before 1927 was largely due to the lack of officers available for assignment to that course. From present indications, the General Line Course appears to meet a long felt need, and will undoubtedly be improved as the years go on. Along with this consideration, however, attention is invited to the Department's report of the Board on the General Education of the Navy, which was published in the Naval Institute PROCEEDINGS of August, 1929. This accepts many of the drawbacks which the Academy curriculum must suffer in four years, and yet attempts to make a definite plan of education throughout the line officer's career. The necessity for the postgraduate school seems to be now without question—and the important duties performed by its graduates in the various technical subjects is the criterion of its importance. The maintenance of the material afloat, and the direction of design and production ashore, have been so intelligently done that the postgraduate curriculum and system, based upon the Naval Academy training, have given excellent results. And recently the showing made by the Navy in winning six Rhodes Scholarships in one year, in competition with all university graduates in the country, is another answer as to whether the Academy course is liberal.

From conversations with educators, ideas have been proposed such as to appoint a commission to consider the Academy curriculum, composed of naval officers and educators. The president of one leading university, who has been a member of our Board of Visitors, regards this as a suggestion toward the solution of the problem. Another eminent college president believes that the Naval Academy system of training has advantages over that of all other colleges in that graduates who have attained successful results at sea are constantly brought back as instructors and heads of departments. He believes that if colleges could bring back many of their most successful graduates to direct certain courses in various subjects, and have enough of them, the colleges might be on a par with the Naval Academy. But, of course, it is impossible for any college to find enough graduates who have the time and means to leave their profession for two or three years and return to teach. In any event, the Naval Academy has been enriched by the suggestions of many of these eminent educators who have been selected as members of the Board of Visitors at the Naval Academy from year to year. And since the establishment of the Reserve Officers' Training Corps there has come to be a greater bond of sympathy and friendship between the Naval Academy and the institutions which have placed the naval training in their curricula. In future years there will be a larger number of officers to choose from for duty at the Naval Academy who have been trained in the methods of leading universities where they have been on duty with the Reserve Officers' Training Corps.

In answer to the author of this splendid article, the writer ventures the prediction that the Academic Board will seriously consider his suggestions, and whatever it decides to do will be for the best interests of the Academy and the service. Further, there is no doubt that each adminstration of the Academy has added another link to the long chain of Naval Academy achievements and reputation. Decades will come and go, times and modern inventions will continue to make increasing demands, and the Academy will meet them. The changes that come, however, should be no reflection on the well-known flag officers of the Navy who grew up with the Academy, guided it and later took up high commands afloat. Their undying faith and high sense of duty was passed on from generation to generation, and the Invisible Spirit of the Graduate goes back to those who sacrificed the emoluments of civil life and stayed with the Navy through thick and thin. We, the officers of the present generation, must never forget what has gone on before. Let us respect the experience and the names of our predecessors in the service who carried along the traditions of the American Navy from the days of John Paul Jones down the long line through David Porter, Farragut, Sampson and Evans, on to the leaders of today.

The Value of Engineering Competition

(See page 33, January, 1930, PROCEEDINGS)

LIEUTENANT CARL J. LAMB, *U.S.N.R.*—I have had some experience in both marine and naval engineering, having made Naval Reserve cruises aboard some ten destroyers, and having had the opportunity of discussing the engineering competition with the members of several classes of postgraduate engineers. I am therefore interested in Commander Weber's article and believe that it presents excellent support of the competitive plan.

The United States Shipping Board has an engineering competition, operative on half-yearly periods, based upon a minimum mileage traveled each period, and having a fixed "bogey" for each vessel. Certain large merchant fleets also have an engineering competition, based upon total operating cost a mile, for fixed periods.

In spite of adverse criticisms often expressed by many naval officers, the writer believes that Lieutenant Commander Weber has demonstrated the unquestioned value of the engineering competition to the naval service from both economic and military viewpoints. The article aptly proves one basic truth: any system, regardless of age, complexity, or theoretical value, will only be a success when administered with vigor, loyalty, and careful planning, and will fail to be a success if not so administered.

The suggestion is advanced that, rather than have the competition on the basis it is at present, it might be possible to set a "bogey" for each vessel based upon its condition, new, at time of joining the fleet, and then compute yearly scores based upon comparisons with the predetermined fixed values. With such a plan, it would not be advisable or necessary to change the fuel allowance during the life of the vessel, except in case of marked improvements, changes in h.p. rating or reconditioning of the plants, as has been done recently on some of the battleships. The competition would then become one between ships, to determine each year which one could beat the original value assigned by the greatest percentage, and there would be no incentive to "let down" due to fuel allowances being reduced after winning first place. The basic urge and opportunity would remain to try each year to be better in the value originally laid down by the largest possible percentage.

It would be interesting to know if the British, Japanese, and French navies have engineering competitions and if so, what forms they follow. It would also be of interest to know if the United States Coast Guard has such a competition, and the system in use.

The College, the Technical School, and the Naval Academy

(See page 123, February, 1930, PROCEEDINGS)

LIEUTENANT (J.G.) HARRY SANDERS, *U. S. Navy.*—Commander Rossell's interesting article serves a most useful purpose in evoking thought on a subject of vital importance to the Navy. He has shown quite conclusively, I believe, that the Naval Academy course has kept pace with the changing standards of higher education.

It appears that under any system of education the basic requirement is the formation of an attitude of mind, a habit of thought, and a manner of approach which will enable the student to successfully cope with the work of his profession. In these days of intense specialization a college education means only conveying the student across the threshold of his future work. If he is given a broad general basis of principle, an intelligent insight into the application of these principles, and an appreciation of the relationships of his work to the kindred great sciences, he has gained much.

The Naval Academy is fortunate in having several unique advantages over civilian schools. Its primary mission is the development of military character. The midshipman is taught by precept and example from the rich heritage of our naval tradition to develop his own character towards the highest ideals of the service. Such a foundation on which to build a solid character, such guidance for his future, such a broadening outlook upon life, is a priceless acquisition.

Two of the most prominent and most valuable traits that the Academy develops are adaptability and teachability. Both of these terms savor of a generality of viewpoint. The very nature of the service requires these virtues and they appear to be highly developed.

In the matter of academic work, the Naval Academy system makes each midshipman produce results in the classroom at very frequent intervals, often daily. Such a rigor-

ous system makes hard, well-regulated study mandatory. I believe that the small sections, the frequent recitations and marks, contribute much to high scholarship. Such a system elicits a broader as well as a more detailed understanding of the particular subject and therefore a better basis for that association of ideas which is the essence of general education.

While the midshipmen may lack some cultural study, yet they have an unusual opportunity for first-hand assimilation of general information on the summer cruises. It is well accepted, I believe, among modern educators that travel is one of the most boardening of educational influences. Furthermore, as Commander Rossell points out, the cruises enable the midshipmen to observe and understand the men whom they afterwards will command.

It is perceived, therefore, that the Naval Academy, gifted with unique broadening influences, can teach fewer cultural subjects than most engineering schools and yet give a more general education. Commander Rossell's proposal offers to provide more cultural study without undue curtailment of technical work. His point regarding the teaching of fundamentals and basic theories is particularly good. To serve as an illustration, in order to predict with great accuracy the behavior of the various types of direct-current motors and generators it is only necessary to correlate a diagrammatic sketch of the winding with two or three fundamental natural laws which may be conveniently expressed by two or three simple formulas. To remember the characteristics of these various machines is quite a feat—and one which requires much obstinate work. But given the principles, to think them out is quite simple.

As a recent graduate who has had time to carefully consider his Academy course, I feel that the Naval Academy education is of a high order of excellence. Commander Rossell's article views introspectively this splendid training with the motive of working further improvement.

A Method of Calibrating Range Finders at Sea

(See page 137, February, 1930, PROCEEDINGS)

COMMANDER W. A. LEE, JR., *U.S. Navy.* The method of checking range finders at sea, as given by Commander Parker, while possibly subject to observational errors, is certainly better than to check at all. In calculating the formula for the correct range, he seems, however, to have gone to unnecessary trouble.

He measures first the range R' to one end of a test base B. This range R' corresponds to an angle Θ subtended by the length of the range finder, b. He then brings both ends of the test base B into coincidence, and reads the scale S. The range S corresponds to an angle subtended by the base b equal to Φ. Both of these angles are in error but the error is the same in each. There is no error in the difference $(\Phi—\Theta)$. The angle $(\Phi—\Theta)$ is the angle subtended by the test base B at the correct range R.

As a result the first measurement, we have Θ equal b/R'. As a result of the second measurement, we have Φ equal to b/S. $(\Phi—\Theta)$ then equals $b(1/S—1/R')$. And the correct range R is equal to $B/(\Phi—\Theta)$, equal to $B\,(R \times S)/b(R'—S)$ #.

The above formula seeems to me to be more exact, as well as simpler, than the one given by Commander Parker. It is realized that unavoidable observational errors will exist, and that probably both formulas are more exact than necessary. Using the average measurements in the two cases cited by Commander Parker, but using the formula above, we would have:

*B—4.583 .. log 0.66115	
*b—1.6404 . log 0.21495	
B/b—2.794..log 0.44620	
*R'—2765 .. log 3.44170	
*S—715.5 .. log 2.85461	R'—6240 .. log 3.79518
	S—1575 .. log 3.19738
R'×S ..... log 6.29631	R'×S .... log 6.99246
*R'—S—2049.5 log 3.31165	R'—S—4665 log 3.66885
R'×S/ (R'—S) log 2.98466	R'×S/(R'—S) log 3.32361
B/b ..... log 0.44620	B/b ..... log 0.44620
R—2697# . log 3.43086	R—5886.# log 3.76981
(R'—R)—68.0 yards#	(R'—R)—354 yards#

By using the starred values in the left-hand column above, we can make a slide-rule solution, which is probably accurate enough for all practical purposes.

B/b—2.795	2.795
(B/b)/(R'—S)—0.001363	0.0006
R'×S—1980000.000000	9840000.0000
R....2700 yards#....5900 yards#.	
R'—P....65 yards#....340 yards#.	

PROFESSIONAL NOTES

MARCH 2 TO APRIL 1

LIEUTENANT COMMANDER D. B. BEARY, U. S. NAVY
LIEUTENANT COMMANDER D. C. RAMSEY, U. S. NAVY
AND
PROFESSOR HENRY BLUESTONE, U. S. NAVAL ACADEMY

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UNITED STATES

Vessels Under Construction, U. S. Navy—Progress of February 28, 1930

Type Number and Name	Contractor	Per cent of Completion				Probable date of Completion
		Mar. 1, 1930		Feb. 1, 1930		
		Total	On Ship	Total	On Ship	
LIGHT CRUISERS						
Pensacola (CL24)	New York Navy Yard	100.		99.9	99.9	
Northampton (CL26)	Bethlehem S.B. Corp. (Fore River)	94.1	93.4	91.3	90.4	6/13/30
Chester (CL27)	American Brown Boveri Elec. Corp.	88.	88.	85.	85.	6/13/30
Louisville (CL28)	Puget Sound Navy Yard	72.3	69.2	68.6	66.3	3/13/31
Chicago (CL29)	Mare Island Navy Yard	71.8	67.3	67.	63.5	3/13/31
Houston (CL30)	Newport News S.B. & D.D. Co.	87.2	86.9	83.4	82.9	6/13/30
Augusta (CL31)	Newport News S.B. & D.D. Co.	72.4	71.5	70.4	69.3	3/13/31
CL32	New York Navy Yard	1.6	.6	.7		12/ 1/32
CL33	Bethlehem S.B. Corp. (Fore River)	7.2	4.	5.3	3.5	8/15/32
CL34	Puget Sound Navy Yard					4/ 1/33
Indianapolis (CL35)	New York Shipbuilding Co.	4.6	1.9	2.7	1.5	8/15/32
CL36	Philadelphia Navy Yard					9/ 1/33
FLEET SUBMARINES						
V-5 (SC1)	Portsmouth Navy Yard	95.2	94.5	93.2	92.5	6/ 1/30
V-6 (SC2)	Mare Island Navy Yard	89.3	86.7	86.	83.6	9/ 1/30
V-7 (SC3)	Portsmouth Navy Yard	.3				8/ 1/32

Authorized by Act of August 29, 1916.

12 Destroyers Nos. 348 to 359 inclusive—no funds for construction.

1 Transport No. 2—no funds for construction.

2 Fleet submarines Nos. 170 and 171—to be undertaken in fiscal year 1930.

1 Neff submarine No. 108—no funds for construction.

Authorized by Act of February 13, 1929.

5 Light cruisers—to be undertaken in fiscal year 1930.

5 Light cruisers—to be undertaken in fiscal year 1931.

1 Aircraft carrier—to be undertaken in fiscal year 1930.

Navy Oil Lands

New York *Times*, March 30.—Now that all but one of the trials at law due to the naval oil leases have ended, the question arises: What is the present status of the oil reserves of the United States Navy? There have been repeated reports of the draining away of the government oil deposits by adjoining private operators.

These reports mainly involved the Elk Hills, where certain government leases are still in effect. This is the reserve that figured in the case of Edward L. Doheny, who was acquitted of a charge of bribing former Secretary Fall to get lease rights. Lately Harry F. Sinclair, acquitted of conspiracy with Fall in the Teapot Dome lease, asserted that, due to drainage by neighboring Salt Creek private wells, "there is very little recoverable oil left in Teapot Dome."

On the other hand, Admiral H. H. Rousseau reports that the vast oil reserves of the United States Navy are everywhere intact. Admiral Rousseau is chief of the naval oil office.

The Teapot Dome reserve, being a single unit, furnishes the simplest example of how the government tends its fuel supplies for war and other purposes. This structure was shut down completely on December 31, 1928, immediately after the recapture of the field following the finding that the leasing of it to Harry F. Sinclair by former Secretary Fall was fraudulent.

From Teapot Dome had been taken approximately 3,500,000 barrels of oil, of which 1,442,000 had been produced by the Mammoth Oil Company, which has been in receivership for more than four years.

The government "sealed" the field, shutting down sixty-two wells and stopping operations.

However, frequent tests are made, by experts in coöperation with the United States Geological Survey, at selected wells in the various sections to see if the underground supply is being drained off by producing fields in Salt Creek to the north and other fields to the north and northwest.

These tests consist of measuring the gas pressure of the wells, for a diversion of oil through underground passages also would

result in diversion of gas and a lowering of the pressure. No lessening of pressure has been recorded, Admiral Rousseau says.

The same policy is applied to the Elk Hills section. But an entirely different condition obtains in that great field, Admiral Rousseau explains.

The government does not own all of the leases in the 35,000-acre tract, its holdings covering only 74 per cent of the territory, under which there are estimated to be 600,000,000 barrels of oil.

Oil has been produced for many years and still is being produced on the government land at Elk Hills, the total "take" having amounted to about 30,000,000 barrels.

Under the former government policy, which tended to an exploitation of its oil resources—the policy that in a measure led up to the discredited Sinclair and Doheny leases—many producing companies were granted rights to drill on the Naval Petroleum Reserve properties. The government receives profits from this production on a royalty basis. But the new policy is to forego these profits rather than continue a system which has resulted in 5 per cent of the total estimated supply being taken from the government's Elk Hills field.

Out of the Elk Hills wells, on 960 acres of land leased from the government, now are coming 225,000 barrels of oil a month, it is reported. These producing fields are the sole survivors among a large group which were closed down wherever the government could find a means of canceling leases.

One of the important operators is the Belridge Company, which produces 70,000 barrels a month, or about one-third of the monthly total. This company has 300 acres, of which only a relatively small portion has been exploited.

The tenure of the holder of the remainder of the leased tracts, 660 acres, is uncertain, Admiral Rousseau asserts. This property is the scene of operations by the Pan-American Company, whose title to the leases under which it operates now is a subject of litigation. These leases, known as the consolidated lease, were contended to be faulty in a suit brought by the government in Los Angeles last November. The hearing has been continued until next month, when a decision is expected on the validity of the deal. If the suit is won by the government, indications are that the properties affected will be closed and held intact for future governmental use.

Meanwhile the government is guarding constantly its supplies in the recovered land in the Elk Hills region, known to officials as Reserve No. 1, and gas pressure tests are taken at certain points as often as every ten days.

Some portions of Reserve No. 1 are contiguous to active producing centers. Though no drainage has been detected, action has been taken to provide further safeguards. A bill now before Congress would permit the government to obtain territory in the Elk Hills region as a border of safety around its holdings.

A field force of geologists and other experts is constantly on duty; so, too, are the tenders of wells which have been closed down and the experts who make these valuable pressure tests. Their tests are guided by the advice of a naval reserve committee, a board of specialists headed by W. C. Mendenhall, chief geologist of the Geological Survey.

All branches of the work converge in the office of Admiral Rousseau.

GREAT BRITAIN

Naval Estimates

London *Times*, March 7.—The navy estimates for the year 1930 were issued yesterday (No. 84, 10s. net), and also a statement of the First Lord of the Admiralty explanatory of the estimates (Cmd. 3506, 3d. net). The statement is as follows:

The navy estimates for 1930 show a reduction of £4,126,000 below the estimates for 1929. Their net total is £51,739,000, as against £55,865,000 last year.

This substantial decrease is due mainly to the reductions which the government have felt justified in making in the shipbuilding programs of 1928 and 1929, in accordance with a policy which has already been stated to Parliament.

Although the decisions affecting shipbuilding have been announced as arrived at, it may be convenient to summarize them here:—

5 vessels of the program of 1928 have been canceled, viz.:

2 cruisers (10,000-ton type, with 8-inch guns).
2 submarines.
1 submarine depot ship.

12 vessels of the program of 1929 have been canceled, viz.:

2 cruisers (one of 10,000-ton type, with 8-inch guns).
4 torpedo-boat destroyers.
3 submarines.
2 sloops.
1 netlayer and target-towing vessel.

In addition, the decision whether the three remaining submarines of the 1929 program are to be proceeded with has been deferred until after the London Naval Conference has been concluded.

If the full program of these two years had been put into effect the new construction provisions in these estimates must have risen by over £1,000,000 to the neighborhood of £10,000,000 as compared with the provision of £8,621,626 in 1929. Actually the provision now proposed is £5,603,481. The effect of the changes is therefore to reduce expenditure on new construction in these estimates by over £4,000,000.

As to future shipbuilding the government have decided not to formulate any proposals until the results of the London Naval Conference are known and have been fully considered. No provision, therein stated is included in these estimates for commencing any further new construction in 1930. As soon as the government are in a position to inform Parliament of their intentions, a statement will be made on the subject, and, if necessary, a supplementary estimate will be presented.

It should be noted, too, that in the case of the three submarines which remain in the program pending a final decision after the conclusion of the naval conference, these estimates do not provide for any expenditure. If it should be found necessary to proceed with them, Parliament will be asked later in the year to make such additional financial provisions as may be required.

Next to the reduction in the new construction provision, the most noteworthy feature in these estimates is the reduction which they forecast in naval personnel. Great attention has been paid by the Admiralty in recent years to the question of fleet numbers, with the object of securing the greatest possible economy in personnel, without,

The following is an abstract of the navy estimates for 1930, with the comparable figures for 1929:

Votes		Estimates 1930		Estimates 1929	
		Gross estimate	Net estimate	Gross estimate	Net estimate
	I.—NUMBERS		Maximum numbers		Maximum numbers
A.	Number of officers, seamen, boys, and royal marines	97,050	97,050	99,800	99,800
	Number of royal marine police	500	500	500	500
	II.—EFFECTIVE SERVICES	£	£	£	£
1	Wages, etc., of officers and men of the royal navy, and royal marines, and civilians employed on fleet services	14,049,102	13,990,000	14,309,560	14,244,000
2	Victualling and clothing for the navy	4,417,700	3,679,000	4,718,933	3,873,400
3	Medical establishments and services	468,210	403,200	485,227	420,000
4	Fleet air arm	1,267,000	1,267,000	1,300,000	1,300,000
5	Educational services	307,879	231,200	313,965	232,200
6	Scientific services	561,210	480,800	548,464	470,400
7	Royal naval reserves	392,297	392,000	392,435	392,000
8	Shipbuilding, repairs, maintenance, etc.:—				
	Section I.—Personnel	6,683,429	6,209,000	7,069,020	6,770,000
	Section II.—Material	5,878,500	4,127,300	6,657,500	5,021,300
	Section III.—Contract work	5,017,180	4,934,000	7,318,804	7,228,300
9	Naval armaments	3,891,473	3,366,800	3,930,667	3,544,000
10	Works, buildings, and repairs at home and abroad	2,621,350	2,073,950	2,435,400	1,907,700
11	Miscellaneous effective services	786,700	706,850	792,270	721,800
12	Admiralty office	1,224,840	1,208,500	1,202,911	1,187,000
	Total Effective Services....£	47,566,870	43,069,600	51,475,156	47,312,100
	III.—NON-EFFECTIVE SERVICES				
13	Non-effective services (naval and marine) —officers	3,138,204	3,120,000	3,091,979	3,068,500
14	Non-effective services (naval and marine) —men	4,600,300	4,567,200	4,561,550	4,527,000
15	Civil superannuation, compensation allowances and gratuities	984,765	982,200	959,715	957,400
	Total Non-Effective Services....£	8,723,269	8,669,400	8,613,244	8,552,900
	GRAND TOTAL....£	56,290,139	51,739,000	60,088,400	55,865,000

Net decrease:—£4,126,000.

of course, jeopardizing essential requirements, including proper provision for training. Vote A for 1929 provided for 99,800 officers and men, but it was explained that this, the maximum number to be borne during the year, was the anticipated bearing on April 1, 1929, and would fall to 98,800 by April 1, 1930. As a result of further economies, the number now proposed to be reached by April 1, 1930, is 97,050, which is expected to fall to 94,000 by April 1, 1931.

Even allowing, however, for these two main factors, the presentation of estimates so much lower than those of 1929 has only been rendered possible by a very close scrutiny of every service with the object of curtailing expenditure. Of the causes operating in the contrary sense, I should in particular mention the increase of expenditure under the Singapore Base main engineering contract. Although no new commitments are being entered into pending the result of the London Naval Conference, it has been found that it would not be economical to retard the work contracted for, and, in accordance with the terms of the contract, considerably larger payments will have to be made in the year 1930 than in the current financial year. This and other additional commitments falling upon 1930, such as the effect of periodic increments of salary, additional provision for cost-of-living bonus, the automatic growth of the non-effective votes, additional purchases owing to the reduction in the quantities of stocks available for use in relief of cash expenditure, and the institution of the holiday week with pay for industrial staff, amount to about £1,000,000.

The estimates which were presented in 1924 were subject to an overhead deduction, intended to discount in advance possible delay in the progress of contract work, and on the understanding that, should such work proceed without interruption, the position would be dealt with when it arose. This system, with the approval of Parliament, has been adopted in every subsequent year. A similar deduction has been allowed for in 1930, regard being had to the smaller amount of contract work.

ENGINEERING AND RADIO

Diesel Engine Weights

Marine Engineer and Motorship Builder, March, 1930.—In the earlier stages of the development of the marine Diesel engine, and when the detractors of that prime mover were much more numerous than they are today, it was frequently advanced by way of criticism that the very high specific weight of the Diesel engine was a factor likely to retard its development and restrict its application to comparatively slow-speed cargo vessels where excessive machinery weight, as such, was not held to be of primary importance. It cannot be gainsaid that such criticism was not wholly unmerited, but how rapid has been the progress and how different the line of development from that then foreshadowed is best illustrated by the fact that the motor cargo liner of today is setting the pace in ocean speeds, and by the further fact that, in certain special forms, the internal-combustion engine can now be built with a specific weight actually lower than the most up-to-date steam propulsion machinery.

A convenient starting point in any discussion of the progress which has been made in weight reduction of direct-drive marine Diesel machinery is furnished by the latest production of that pioneer firm of marine oil engine builders, Burmeister and Wain, of Copenhagen. The machinery in question is that fitted to the East Asiatic Company's new motorship *Amerika,* and as the same owners and builders were concerned with the first sea-going motorship, the *Selandia,* of 1912, a comparison between the specific weights of the machinery in these two ships becomes peculiarly appropriate. In the 4-stroke cycle, single-acting, air-injection machinery of the *Selandia,* the specific weight was of the order of 450 lb. per b.h.p., whereas in the 2-stroke cycle, double-acting, airless-injection engines of the *Amerika* the specific weight at 7,000 b.h.p. rating is approximately 115 lb. per b.h.p., as we stated in the article on this notable vessel which we published last month. In the later machinery the mean indicated pressure of 92 lb. per sq. in. is, of course, substantially higher than in the *Selandia* machinery, and the materials available for the manufacture of internal-combustion engines today are much superior to those of eighteen years ago. That the specific weight of the *Amerika's* machinery should have been reduced to a figure approximately only 25 per cent of that for the *Selandia* is nevertheless a remarkable achievement for direct-drive engines, and the measures of that achievement will perhaps be better appreciated by extending the comparison to the high-speed geared machinery of the Hapag liners *St. Louis* and *Milwaukee.* In these two ships high-speed, 2-stroke cycle, double-acting M.A.N. engines, running at 215 r.p.m., are connected in pairs to the propeller through single-reduction gearing, giving a propeller speed of 110 r.p.m. It was claimed for this drive at the time of its inception that the specific weight was lower than any hitherto attained in any marine installations of equivalent power. Excluding the scavenging pumps and reduction gearing, the specific weight of these installations has been given as 110

lb. per b.h.p., but with the gearing included the figure is approximately 125 lb. per b.h.p., i.e., greater than that of the machinery of the direct-driven *Amerika.*

Apart from the great step forward represented by the *Amerika,* and excluding, for the time being, such weight-saving intermediaries as mechanical reduction gears, it is apparent from a perusal of the papers read and the discussions which accompanied them at the recent World Power Conference and World Engineering Congress at Tokyo, that, in certain quarters at least, the view is held that direct-driven Diesel engines for the propulsion of passenger liners can now be built with a specific weight which compares favorably with that for the most modern geared steam turbine installation. In these discussions Mr. Y. Okamoto referred to the figures given by Mr. John Johnson in his Institution of Naval Architects paper of last year relating to one of the Canadian Pacific 18,000-s.h.p. geared turbine installations, for which the machinery weight was given as 2,275 tons, equivalent to 0.126 ton, or 282.24 lb. per s.h.p. Taking for purposes of fair comparison the latest quadruple-screw, direct-drive Diesel engines, with supercharging and exhaust gas boilers for an installation of 22,000 s.h.p., the machinery weight was stated to work out at 2,200 tons, equivalent to 0.10 ton or 224 lb. per s.h.p., from which it is deduced that the Diesel installation was actually lighter than the geared turbine machinery by about 15 per cent, expressed on a specific weight basis. The most sensational development with regard to weight saving in a marine Diesel installation is, of course, that at present being completed for the German warship *Ersatz Preussen.* In this remarkable vessel quadruple-screw geared Diesel machinery of 50,000 b.h.p., comprising four sets of the latest M.A.N. double-acting, 2-stroke cycle, airless-injection engines will be fitted running at 215 r.p.m. and driving through single-reduction gearing. The specific weight of these engines is assessed at the phenomenally low figure of 17 lb. per b.h.p., and since the same makers have recently completed two similar type 11,700-b.h.p. high-speed, double-acting, 2-stroke cycle 10-cylinder engines for use in a Berlin electric-generating station, with a recorded specific weight of 55 lb. per b.h.p., some mystery attaches to the means whereby the warship machinery weight has been reduced to less than 30 per cent of that already low figure. At the same time it should be pointed out that the weight of engines, gearing, thrust block, shafting, etc., gives a specific weight figure of about 51 lb.

The question of weight reduction in marine Diesel machinery is largely bound up with that of metallurgical science, as represented by the production of the highest grade materials. While recognizing fully the measure of the achievement represented by the *Ersatz Preussen* installation, and assuming that such machinery will prove itself to be entirely dependable on service, it does not necessarily follow that machinery of this special, highly rated and, presumably, highly costly construction will prove suitable or desirable for the wear and tear of mercantile tonnage. What is important, however, as the foregoing record shows, is that the former criticism on the score of excessive weight can no longer be applied to the marine Diesel engine.

First Rivetless Ocean-Going Cargo Vessel Launched

Nautical Gazette.—The first rivetless cargo vessel, a 2,500-barrel oil tanker, has just been completed in the shipbuilding yards of the Charleston Dry Dock and Machine Company, Charleston, South Carolina, and was launched February 14. Its service test will take place about February 28, after which it will go into service for the Texas Oil Company.

The vessel was constructed entirely by the arc-welding method and has not a rivet, bolt nor structural angle anywhere in its structure. The arc welding was done under a new system of dovetailed, lock-notched plates, developed by Richard F. Smith, a young ship designer and inventor. One acetylene cutting torch and one General Electric arc-welding machine were employed. Only nine workmen were required and 8,000 pounds of welding wire were used as compared to 85,000 pounds of rivets which would have been necessary had the construction been by the riveting method.

The preliminary estimate of Mr. Smith was that a saving of 20 per cent in weight and of 25 per cent in the cost of construction would be realized as compared to riveted vessels. These figures were verified in the

actual work, and in addition the vessel was found to have greater cargo capacity because of the absence of rivets, bolts and angles. The ship is 120 feet in length and 23 feet in width, and has a 10-foot draft. The United States Navy Department, as well as a shipbuilding corporation, a railroad company and foreign shipbuilders, has inspected the vessel.

Machines Will Record Static To Detect Gulf Hurricanes

New York *Times*, March 16.—The detection of tropical disturbances in the Caribbean Sea and Gulf of Mexico is expected to be facilitated by a static disturbance recorder developed for the Navy. Nine of the machines will soon be installed in those areas.

Naval hydrographic officers said today that "by means of simultaneous cross bearings from the various stations it was hoped that the storm centers could be located when still far distant and the movement of the storm followed continually."

They believe that storm centers and heavy static sources are associated. The equipment will make continuous automatic records of static disturbances.

The detection of storm centers has obtained impetus by the experiments of Lieutenant E. H. Kincaid and W. B. Burgess, of the Naval Research Laboratory.

Television, Present and Future

Engineering, March 14.—As was to be anticipated from the title, "Television, Present and Future," which Sir Ambrose Fleming chose for his lecture, delivered in connection with the Physical and Optical Societies' Exhibition on January 9, he merely referred in his introduction to the various attempts made to transmit images of moving objects and kinematograph pictures, and to the proposals for the construction of television apparatus. There is little to be said about the present achievements in television, and the lecture was essentially an exposition of the scientific basis of the methods and devices and of possible future progress, with special reference to the Baird system.

Television, Sir Ambrose explained, depended upon the persistence of vision, the fact that the effect of a stimulation of the retina persisted for about $\frac{1}{16}$ second, so that stimulations succeeding one another at shorter intervals would not be distinguished by the eye as separate impressions. Thus, if a spot of light were made to travel downwards over an object and the journey was then repeated over and over again in parallel lines displayed more and more to the right or left, the eye would see the whole object, provided that the latter were completely covered in $\frac{1}{16}$ second. Moreover, if we could produce a similar spot of light at a distance, moving in synchronism with the first and varying in intensity in accordance with the color of the object, we could reproduce the latter. At the transmitting end, the spot of light was produced by a scanning disc which was perforated by a series of 30 holes arranged in an equiangular spiral of one complete turn. Such a spiral was first used by Nipkow in 1884. The diameter of each hole was $\frac{1}{30}$ of the pitch of the spiral, and the disc was rotated at the rate of 16 r.p.s., or more, the rays from a high-power incandescent lamp being focused by a lens upon the object. The scanning of a human face in this way caused no inconvenience. The lamp, disc, and motor were generally placed in one room, and the scanning rays were passed through a small opening in the wall to fall upon the face of the subject sitting in front of a screen.

The light scattered from the face was received by a photo-electric cell, or a battery of cells. Falling upon the cathode of the cell, the rays liberated electrons without any time lag, and the current from the grid of the cell was amplified by valves and transmitted by wire (or wireless) to the receiving end. The current was proportional to the momentary intensity of the illumination. The cell consisted of a glass bulb, in which an alkali metal was deposited on a thin coating of silver or copper. The cells were made in two types: vacuum cells for scientific measurements, and more sensitive gas cells, containing argon or helium at a pressure of about one-sixth of a millimeter of mercury, for commercial purposes. The potassium film, as such, was most sensitive to violet light, but its deposition on to copper rendered it more generally sensitive to the spectrum. At the receiving end, these photo-electric currents were reconverted into light by the aid of neon lamps. The neon lamps contained two plate electrodes about 1 mm. apart. When these were charged by a local battery to a potential difference of 200 or 300 volts, the

cathode began to glow with the reddish neon light all over its surface, and the glow increased in intensity in accordance with the currents which were received from the sending station; the starting and stopping of the glow were instantaneous. If, then, this glow were observed at the receiving end through the holes of a second scanning disc, kept in exact synchronism with the first, the observer would see the object reproduced by the phenomenon of persistence of vision. The television picture, Sir Ambrose remarked, did not consist of a set of dots like a process block, as was often assumed. It was built up of a series of line elements or arc-shaped strips. The great difficulty of maintaining exact synchronism between the two scanning discs had been overcome by Mr. Baird by the aid of the received current which composed the picture.

Passing to future developments, the lecturer mentioned suggestions he had himself made to Mr. Baird. At present the object of which the image was to be transmitted had to be placed in front of the screen. If the object were horizontal, a large plane mirror could be placed in front of it at 45 degrees so as to reflect the horizontal scanning rays vertically upwards. The size of the object was, moreover, practically limited to about that of a human head. The size of a large object could be suitably reduced with the aid of a large convex lens, the image of which would be scanned through the spiral-hole, disc, or by one of the less expensive large concave mirrors. The beam of light from the mirror would be reflected by a small plane mirror as in a Newtonian telescope, and would be focused on to the surface of the scanning disc. In this way eclipses of the sun or moon might be televised. Very highly sensitive photo-electric cells would be required and the most recent cells of the research laboratories of the General Electric Company at Wembley, containing cæsium films deposited on oxide of silver, were ten times more sensitive than potassium films. Larger neon lamps were also required. In America, such lamps had been fitted with 2,500 electrodes but these were suitable for costly research and not for commercial use.

MERCHANT MARINE

Europa Wins Blue Ribbon

New York *Times*, March 30.—Man and his machines are constantly making new speed records. Last week the *Europa* of the North German Lloyd Line took the blue ribbon from her sister-ship, the *Bremen*, by crossing the Atlantic in 4 days, 17 hours, and 6 minutes, that is, in 18 minutes less than the *Bremen*.

The newly acclaimed speed queen of the seas has recorded a doubly notable achievement in that she was forced to combat head winds and head seas during the first days of her voyage to surpass the record of her sister-ship, the *Bremen*. Perhaps in so doing she has cleared herself of the suspicion of a "jinx" which had been suggested by the disastrous fire which swept her last year as she was nearing completion.

In the *Europa* it is said that the builders profited somewhat by the tests of the *Bremen*. To a superficial examination, there are certain minor but very real differences. By the nautical expert, the unofficial competition of the two vessels for future voyages will be watched with interest, particularly to determine if the features incorporated in the *Europa* and not found in the *Bremen* have a part in the speed of the new title-holder.

Perhaps the most notable of these features is the bow of the *Europa*, which is slightly more bulbous than that of her sister. The principle of the rounded bow in the ever-waged quest for speed was forecast after the World War while the sharp-bowed liners held a monopoly of speed records.

The *Europa's* propellers, it is further noted, are smaller than those of the *Bremen*, but are capable of more revolutions per minute and they are differently arranged. Whereas the *Bremen's* churn the water outward, two of the *Europa's* churn the water inward and two outward, thus taking further advantage of the dead water created at the stern by the bulbous bow as against the outward push of the water from a sharp bow.

94 Ships Being Built in American Yards

New York *Times*, March 10.—Ninety-four vessels of 316,726 gross tons were under construction March 1 in the shipyards of the nation, according to the bi-monthly report of the American Bureau of Shipping. Vessels of the ocean-going and Great Lakes type of more than 500 gross tons totaled 29 and their tonnage 284,107, whereas miscellaneous vessels, such as ferryboats and

barges, while totaling 65 had a total tonnage of only 32,619.

Twenty-seven shipyards were engaged in the construction of these vessels, eleven of the yards being engaged on the larger ships. Many of the larger yards, including the Bath Iron Works Corporation, the Bethlehem Shipbuilding Corporation, Ltd., the Federal Shipbuilding and Dry Dock Company, the Pusey and Jones Corporation, and the Sun Shipbuilding and Dry Dock Company were at work on both large and smaller vessels.

The report of the bureau shows that the larger ship lines have started to enlarge their fleets with the aid of the government funds made available by the merchant marine act of 1928. Whereas the bureau's report for many years was confined largely to yachts and tankers in the classification of vessels of more than 500 gross tons, with a passenger vessel occasionally appearing, the current report finds nine passenger vessels under construction. Two of these, the Ward liner *Morro Castle* and the Grace liner *Santa Clara,* have been launched since the report was compiled.

The Newport News Shipbuilding and Dry Dock Company, which built the *Morro Castle,* is reported by the bureau to be at work on her sister-ship, the *Oriente,* and a 21,000-ton Dollar liner, the largest ship reported under construction. The New York Shipbuilding Company was reported building the Grace liner *Santa Clara,* which completed its speed trials last week, and also three ships of 8,500 tons each for the Export Steamship Company.

The Bethlehem Shipbuilding Corporation, Ltd., was reported building an 18,500-ton passenger vessel for the Matson Navigation Company, a passenger vessel of 7,057 tons for the New York and Porto Rico Steamship Company, two tankers of 6,100 tons each for the Sinclair Navigation Company. The largest tanker under construction is a 15,000-ton craft for the Standard Shipping Company at the Federal Shipbuilding and Dry Dock Company yard.

The Sun Shipbuilding and Dry Dock Company leads the field in large tankers, reporting four of 9,000 tons each, under construction for the Sun Oil Company, the Tidewater Associated Transportation Corporation, the Standard Transportation Company, and the Motor Tankship Corporation. Only one yacht of more than 500 gross tons was reported building. That is the *Corsair,* owned by J. P. Morgan.

Shipping Board Engineering Competitions

Neptune Log, March, 1930.—In July, 1922, the United States Shipping Board Merchant Fleet Corporation, in its endeavor to improve the efficiency of operation of its vessels, established a Fuel Conservation Committee. The members of this committee were selected from various representative organizations concerned with the operation of ships. The chairman of the committee is C. A. McAllister, President of the American Bureau of Shipping.

The committee proceeded to formulate a program designed to improve the art of fuel burning; to educate the seagoing personnel in the proper operation of the machinery of the vessels; to standardize, analyze and compare the operation of its vessels; to experiment with, develop and put in use means of improving the engineering efficiency of the vessels.

In coöperation with the United States Navy, schools were established at the Philadelphia navy yard and the Mare Island navy yard, Vallejo, California, to instruct merchant marine engineers in the proper methods of burning fuel. A total of 1,318 men were instructed in these schools. The cost of this instruction has been repaid to the Fleet Corporation manyfold in the more intelligent and economical operation of the vessels' power plants.

Standards of performance were set for each class of vessel operating in the Shipping Board fleet, and as each vessel completed its voyage an inspection was made and the performance analyzed and compared to the standard, pointing out ways of improving the vessel's efficiency and extending commendation for meritorious performances. Through this a healthy spirit of friendly competition and pride of performance has been built up.

Recognizing the desirability of rewarding those officers whose performances were outstanding, the Shipping Board authorized the payment of a semiannual bonus of $50 each to the fifty chief engineers and the fifty masters having the best records for the six months' period.

This honor roll for the first six months'

period of 1929 has just been announced by the Fuel Conservation Committee.

To secure a place on this roll a vessel must have turned in an efficiency of at least 95 per cent of that of the leader of her class, and to have traveled at least 20,000 miles during the six months' period.

There is also announced an honorable mention list which contains the names of fifty masters, and an additional fifty chief engineers, whose performances, although not equaling those on the honor roll, are so meritorious as to deserve mention.

To compile these lists required the analysis of sea and port performances of the voyage of 249 vessels which have traveled a total of 5,638,840 miles during this six months' period. During this period the vessels were at sea 555,634 hours and in port 410,952.

Denoting the increasing efficiency of operation of Shipping Board vessels it is interesting to know that even allowing for the lower price of fuel oil now prevailing, and the increasing age of the vessels, a saving of $77,510 over the preceding six months' period has been achieved.

As a matter of interest in illustrating the continued improvement in operation, it is to be noted that in the case of the Class "A" vessels built at Hog Island, of which there are now 57 in the Shipping Board service, the reduction in fuel per mile since 1923 has amounted to 28 pounds, which for this class of vessel represent a saving of 110,696 barrels for the first six months of 1929 over what would have been the consumption had there been no improvement over 1923.

AVIATION

Final Report on Guggenheim Aircraft Competition

Baltimore *Sun*, March 9.—Although no new device was developed particularly for the Guggenheim Safe Aircraft Competition, the entries covered almost the whole field of features which either practically or theoretically are expected to improve the control or speed range of aircraft, according to the final report on practical results of the tests made public last week. These features include variable wing area, variable wing camber, trailing edge flaps, leading edge slots, slots ahead of trailing edge flaps, variable incidence wing, spoiler lateral control, floating ailerons and fixed leading edge auxiliary airfoil or slot.

Certain general conclusions from the results of the competition are summarized in the report as follows:

The advantages, if any, of variable wing area and variable camber could not be determined due to the unsatisfactory flying characteristics of those aircraft using these features.

The use of a variable incidence wing appears to have little or no justification from any standpoint.

The advantages of slots and flaps in lowering the minimum speed were clearly demonstrated.

The airplane equipped with floating ailerons exhibited unusually good controllability at speeds near the minimum either with or without slots and flaps in operation as such.

The use of the spoiler device did not provide the desired lateral control on the aircraft using it.

With the present type of longitudinal control it is practically impossible to fly an airplane at angles of attack greater than that at which the maximum lift of the airfoil combination is obtained.

The fixed leading edge slot proved to be a detriment to high speed and its effect on low speed could not be established on the airplane equipped with it.

The competition showed that the design and construction of an airplane which will successfully meet a given set of conditions can best be handled by a manufacturer having a well-equipped and experienced engineering division.

It is regretted that all of the competitors originally entered did not submit aircraft for demonstration. The absence of the autogiro was particularly disappointing, since no results of its performance directly comparable with other types of aircraft are available.

Only two airplanes, one of which failed to pass a minor qualifying requirement, exhibited attributes which warranted completion of safety test and demonstrations. These were the Curtiss *Tanager* which was awarded the first prize of $100,000, and the entry of Handley-Page, Ltd., of England.

It is believed that the following devices, all of which are to be found on either the Curtiss or Handley-Page entries are worthy

of incorporation on various types of aircraft or of further study:

Automatic leading-edge slots.

Flaps, either automatically or manually controlled.

Floating ailerons.

Long-stroke, oleo landing gear with provision for locking in the position assumed under load.

Extreme range adjustable stabilizer.

Brakes.

It was expected that more than one airplane would pass the qualifying and safety tests and that the award of the first prize would depend upon points made in comparative tests. Since only one airplane reached the stage for award of points, the comparative tests were not conducted and the prize was awarded to the Curtiss *Tanager*.

The Cost of British Airships

Aeroplane, February 19.—According to the *Times*, Lord Thomson, Secretary of State for Air, speaking at Cardiff on February 14, said there had been wild exaggerations about the money spent on airships. The total amount spent on the program since 1924 was £2,000,000. The two ships that had been constructed had given added knowledge, and a country such as ours must pay for its research.

The airship had been invaluable so far as transatlantic aviation was concerned. To date, 427 people had flown the Atlantic, and 402 of these completed the crossing in airships. The *R-101* was strong enough to stand any gale. Given a good skipper and a good crew, he would go out in the *R-101* in any weather.

With regard to the future development of airships, he knew that they could be built for about £600,000. They could carry 40 passengers and could complete the journey to India or Montreal in three and a half days.

After that the public would determine whether airships were going to be a commercial proposition. At any rate, Great Britain had given the lead to the rest of the world.

Liquid-Cooled Power Plants

U. S. Air Services, March.—Because aviation, he thinks, is rapidly approaching a peak in cylinder resistance offered against the speed demanded, Rex Beisel of Tulsa has turned to careful study of the possibilities in liquid-cooled power plants and declares that he can see a bright future of greater speed just ahead. Mr. Beisel, vice president and engineer of the Spartan Aircraft Company, addressed, recently, groups in the National Society of Automotive Engineers on the trend he discovers toward a return to new cooling processes. Development of greater speed through use of chemical cooling, he points out, discloses greater possibilities in aviation power plants.

The proposed "come-back" of the liquid-cooled motor, Mr. Beisel declares, has a number of prophets. The prediction, he admits, appears to be a bit rash yet. In simple manner he substantiates to himself his belief by considering the fact that the fastest racing airplanes in the world are now cooled with water and the motors are turning over 3,000 r.p.m. The secret, it is pointed out, is found in the maximum reduction of fuselage resistance and the increased cooling facilities of the high-speed water-cooled motors. He said:

> As the industry grows, still greater speed will be in demand. The radial motors will supply this demand to a point. However, a peak will be reached at which it will not be possible further to cut down cylinder resistance. A step toward return to liquid-cooled motors has already been made in chemical cooling. An airplane engine could run at much greater speed—at much higher temperature—were it not for the fact that water, for example, boils at 212 degrees. Since the size of the radiator depends inversely upon the temperature difference between the air and the boiling point of the cooling medium a satisfactory liquid with boiling point higher than that of water will permit the use of a smaller radiator. A chemical formula with a boiling point of 325 degrees F. and freezing point of 0 degrees F. has been compounded. The radiator area required with this chemical is approximately 30 per cent of that required with water as a cooling medium. The use of the chemical offers another advantage due to the small cooling area required. This area can be incorporated on the surface of the wings, or in the form of skin radiators. This has been more or less prohibitive in the use of water because of the excessive cooling area necessary. In the case of the military airplane, the added vulnerability through loss of water from bullet holes has practically prohibited its use. A chemical cooler could allow the radiator to be crowded into a section of the upper wing. At the present time the majority of engines are air cooled. But the maximum horsepower with a reasonably low resistance appears also to be limited to about 600 horsepower and even then the very large frontal area is not conducive to high speed.
>
> In addition, it is difficult to cool an air-cooled

engine at high revolutions per minute—that is, high horsepowered for small frontal area. The air-cooled motor is further handicapped in that gearing is very necessary in the case of high engine revolutions and when geared, an additional cooling problem enters in, in that the velocity of air flowing behind the propeller is materially reduced due to its greater diameter and lower revolutions per minute.

In the case of the liquid-cooled engine of the V or X types, for example, those used in the 1929 international air races, the frontal area is inherently small and since cooling of the engine is a function of the radiator only, it is possible to increase the revolutions of the engine, introducing gearing and obtaining resulting performances very appreciably greater than can be obtained through the use of radial engines.

An Air Minister at Sea

Army, Navy and Air Force Gazette, February 20.—Sir Samuel Hoare, who as Air Minister in the late government speaks, or ought to speak with a certain responsibility, has been making a trenchant attack on the provision of aircraft carriers. He would restrict the fleet air arm to "the limited number of small machines that could be carried on battleships and cruisers." This would mean an end of the fleet air arm as it exists today. On the ground of accommodation alone, there is no room for the 27 flights of the arm to be carried in battleships and cruisers, at any rate without interfering with their gunnery or other work. Take the Mediterranean fleet, with its two carriers. Apart from the naval officers of these ships who are qualified as observers, there are 68 officers in the flights and headquarter units, to say nothing of the hundreds of other ranks and ratings. The fleet has only six battleships and nine cruisers, and they could not possibly absorb these numbers, even if such a scheme was practicable which it is not. Then again, a carrier is equipped to handle aircraft, to maneuver so as to help them take the air, and to drop behind the fleet if need be to gather them in again. A battleship or cruiser could not do this and at the same time engage or pursue the enemy. Imagine the plight of a pilot trying to take off from a turret roof with the guns in action. Granted that carriers are costly. So is all naval war material. The test is rather one of necessity, and carriers are justified by the fact that with them fleet aircraft can be properly accommodated, equipped, concentrated, and utilized in a manner which would otherwise be impossible. Sir Samuel should remember the advice to the cobbler. He may know all about aircraft, but he is no authority on their use afloat or on naval operations.

British 1930 Air Exercises

Army, Navy and Air Force Gazette, March 6.—The air exercises to be held this summer will be planned on a wider scale than those of 1928, when the object was to test the defenses of London against raids. Questions concerning the defense of the trade routes will be investigated, and for this purpose use will be made, for the first time in such exercises, of the flying boat squadrons in home waters. It is also proposed that the aircraft of the fleet air arm shall take part. The new types of interceptor fighters and day bombers which will also be available are expected to afford much valuable information in the elucidation of certain problems of air attack and defense.

Air Defense

Army, Navy and Air Force Gazette, March 6.—The importance of the problem of air defense increases daily. The measures adopted by the great nations for the reduction of armed forces do not decrease the peril of air attack when war breaks out again. That next war, if it be between major powers, will in all probability begin with strong air offensives against vulnerable points in the belligerent countries. No formal notice may be given, and in any case there will be no time to improvise an effective defense system. In 1914 aircraft had not left the initial experimental stage and the numbers available were insufficient for heavy attack on enemy towns and bases. Therefore the improvised defenses of the time grew with the development of the air arm. At the end of the war Great Britain possessed the most elaborate and effective air defense system in the world. A year or two later all had gone except the knowledge. Now the system is being reconstructed slowly but surely. The Air Ministry is responsible for air defense, and the Army units engaged are under the orders of the air officer commanding, air defense of Great Britain, for operations.

At the end of last year the War Office issued the *Manual of Anti-Aircraft Defense (Army Units), Volume II—War.* It is

short—there are only 41 printed pages—but it should be read even by soldiers whose only concern in air defense is an anxiety to avoid airplane bombs and machine guns. The importance of ground units in air defense is often forgotten by those not directly concerned with the principles of air warfare. Defense from air attack is not a matter of airplanes alone. Guns and searchlights play an essential part, and there is moreover a vital and elaborate system of communications which must be maintained if there is to be proper coördination of effort and a proper economy of force.

The new volume recognizes the risk of early enemy air attack. "An enemy, possessing a powerful fleet of bombing aircraft, might so delay the strategical concentration of troops by destroying bridges, railways, embarkation ports, and by bombing mobilization areas as to affect the issue of the campaign." Therefore the air defense system must be capable of mobilization before the opening of hostilities. That mobilization will not be possible unless the country is prepared to spend more money on the defense system than is at present allocated.

The manual classifies the means employed in air defense under two heads, active and passive. The first includes fighter airplanes, "the first and principal weapon of air defense," A.A. artillery, small arms on the ground, searchlights, and sound locators. Passive defense includes balloon aprons and nets—the system developed by Major-General Ashmore and his staff in 1917-18—and concealment and camouflage. The importance of antiaircraft artillery is recognized, as it may on occasion be the primary means of defense. Fog or cloud may hamper defending aircraft as often hampered during the Great War. A.A. guns may be brought into action without long warning—a marked advantage. There is a disadvantage. "Unless the target flies straight from the time at which the prediction is made until the burst of the shell, the chances of hitting are remote. Efforts to shorten the time beyond a certain point by increasing the muzzle velocity of the shell, lead to prohibitive increase in weight of the equipment, and to undue wear in the bore." Some reference might be made here to the virtues of the box barrage, but perhaps that principle has been abandoned.

There is much of the functions of searchlights and sound locators, both of them invaluable aids to aircraft and guns. In regard to the employment of balloon aprons and kites it is pointed out that as they require a large organization "they will be found only in large, permanent, antiaircraft defenses." Those who were concerned with the first production of balloon aprons in 1917 and who remember the pleasant wit of the scoffers will be happy to note that in the present official view "their presence has an undoubted moral effect." There is warning in regard to the use of camouflage as a means of passive defense. It requires an elaborate organization, and those who hope to disguise London as a sewage farm or a desert area will be disappointed. Smoke screens have their value but "they must not be allowed to interfere with the active means of air defense" as they have on certain occasions.

Aviation in Canada

Engineering Journal, Feb. By J. H. Parkin.—The dependence of national development and progress on transportation is nowhere more marked than in Canada. The settlement and development of the Dominion first followed the natural waterways, later the railways, and may now be said to be following the airways. Regions formerly regarded as inaccessible and doomed to remain forever undeveloped are now not only being explored but are actually in process of development practically wholly by means of aircraft.

In perhaps no other country are aircraft being put to as great a variety of useful and practical tasks as in the Dominion. Immediately following the war Canada set about making use of aircraft and taking advantage of their characteristics in everyday peace-time pursuits with such success that aircraft have now become an important factor in the life of the country.

In the use of aircraft for exploration, reconnaissance and surveying, Canada has taken a leading part and has brought the practice of aërial surveying to a high state of development. The value of aircraft in developing and protecting the timber wealth of the country was quickly appreciated in the Dominion, and great strides have been made in the use of aircraft for the detection and suppression of bush fires, for timber cruising, and forest sketching. In the last

few years aircraft have played an important part in development of the mineral resources of the Dominion and have been intensively and successfully employed for prospecting, geological exploration, and in development work, particularly in the great north country known to be geologically favorable but hitherto practically inaccessible. Aircraft are also being employed in the warfare being waged against different pests and blights attacking the forests and crops. The air mail lines are being steadily extended and improved and the use of aircraft for the carriage of express and passengers is continually increasing. For customs and fisheries patrol and many other everyday civil and commercial tasks aircraft are being employed with success in the Dominion.

The success with which aircraft have been used in Canada is remarkable when it is remembered that the operations were in many cases commenced using military types of aircraft and that even now few of the aircraft are specially designed for the service and conditions under which they are operating. The success of the few machines designed for specific purposes indicate what can be accomplished. To make fullest use of aircraft in the country, machines suited to Canadian requirements and conditions must be developed.

In developing aircraft suited to the special services and peculiar conditions, an aëronautical laboratory is essential. Recognizing this fact and the national importance of aviation in Canada, the National Research Council has undertaken, with the approval of the subcommittee of the Privy Council on scientific and industrial research, the establishment at Ottawa of completely equipped aëronautical laboratories. The laboratories planned will compare favorably in extent and capacity with the best in other countries.

While the whole field of aëronautical research embraces most branches of engineering activity as well as many other sciences, the three principal divisions are aërodynamics, hydrodynamics, and power plant. Accordingly, the National Research Council is installing a wind tunnel for aërodynamic research, a test tank for the study of problems connected with floats and hulls, and power plant equipment for the testing of aircraft engines, fuels, etc.

The work of the laboratories will be principally aëronautical research for the purpose of improving the performance of aircraft, developing new types and solving problems arising in connection with the design, construction and operation of aircraft in Canada. Aëronautical testing will also be undertaken for designers, constructors, and operators, and the laboratories will be found very useful for many investigations of a non-aëronautical character.

Not the least important work of the laboratories will be the facilities offered for training in aëronautical research. The experience gained by young men in one or two years of research will be of material benefit not only to them but to the Canadian aircraft industry and aviation.

National Aëronautic Association Plans for 1930

Aviation, March 1.—On February 12, the board of governors of the National Aëronautic Association met at national headquarters, Barr Building, Washington, D.C., under the direction of Senator Hiram Bingham, president, and outlined a program of activities for 1930. Twenty important projects were planned and are as follows:

1. An intensive campaign of aëronautical education among all classes in order to promote air-mindedness.
2. Organization of air tours and air races where such events will serve to further the progress of aviation.
3. Congressional authorization for the airmarking of all post offices and other government buildings where necessary.
4. Suitable state legislation requiring the air marking of all incorporated cities in accordance with the standards of the U. S. Department of Commerce.
5. Urging upon every state and community the establishment of adequate airport and landing facilities.
6. Energetic stimulation of junior aviation activity.
7. Energetic coöperation with civic, social, and commercial organizations and aëronautic groups in the development of aviation.
8. Uniform state aëronautical legislation consistent with the federal laws on the subject and in accordance with the recommended legislation set forth in Aernautics Bulletin No. 18 of the Department of Commerce (i.e. uniform licensing of airmen and aircraft.)
9. Continued development of the air mail system in the United States.
10. The energetic development of international air mail, express, and passenger routes, with special emphasis on such routes throughout the Americas.
11. Rapid development of private flying clubs and glider clubs.

12. Providing an adequate air defense for the United States and its insular possessions. We believe that the first step in that direction is to complete the Army and Navy 5-year programs, modified and augmented to meet changed requirements due to changed conditions.
13. Immediate legislation to provide for a just solution of the difficult personnel problems of the Army Air Corps.
14. Construction by the Navy of additional aircraft carriers.
15. Expansion of Army, Navy, and Marine Corps reserve aviation with proper provisions for airplanes and supplies.
16. Government aid for the more rapid development of airship navigation.
17. Continued development of the industrial war plans system.
18. Adequate awards for noteworthy aëronautic achievements.
19. Further development of aviation insurance and the fostering of aviation coverage in general policies.
20. An adequate headquarters building for the National Aëronautic Association in Washington.

The Henrickson Ice Warner

Aviation, March 1.—An instrument designed to warn pilots of the existence of conditions conducive to the formation of ice has been developed by the Bureau of Standards and is known as the Henrickson ice warner. It consists of a thermal switch located on a strut or other exposed part of the plane in the free air stream, and an indicator installed in the cockpit. A red light in the indicator flashes on at temperatures between 26 and 32 degrees which, according to experiments of the National Advisory Committee for Aëronautics, are those temperatures at which ice is formed in saturated atmospheres. Whether the degree of saturation present in the air is sufficient to prove dangerous is still a matter for the pilot's judgment. Both the lift of the plane and the gross weight are greatly affected by ice formation, which may occur very rapidly between these two temperatures.

Standard pocket-size flashlight batteries are used for ease of installation, and are placed in a small box containing a red lamp within the cockpit. Contact points are made of coin silver. The lower contact is attached to an insulating sheeting of bakelite, and is crescent shaped so the temperature-actuated switch arm can ride over it without jamming due to any increase or decrease in temperature.

The time lag of the instrument is not excessive, although somewhat greater than that of the minimum temperature recorder. A thin aluminum base, to which the bimetal coil is attached, has proved itself a good radiator. In flight tests made by Roger Scott, operations manager at Hoover Field, Washington, the instrument has functioned satisfactorily. Previous laboratory tests made on a standard vibration board, and in an automobile over rough roads in an atmosphere of 32 degrees have shown that the bimetal coil with attached switch arm is sufficiently stiff to operate even when subject to severe vibrations.

Do-X to Attempt Atlantic Flight

Baltimore *Sun*, March 27.—The giant seaplane *Do-X* will fly the ocean and tour North America this summer if plans announced today are carried through.

Taking off from Lake Constance on the German-Swiss border, early in July, the big seaplane, which has a capacity for 150 passengers and baggage, would be flown over a 4,775-mile course to New York City. Stops for fuel would be made at Barcelona, the Azore Islands, and Bermuda.

She would be operated by a crew of six and carry fifty passengers, the small passenger list allowing an increased fuel load for the long hop from Barcelona to the Azores and from the Azores to Bermuda, 1,655 miles and 1,821 miles, respectively. Allowing for an average 25-mile-an-hour head wind the elapsed time of the flight would be about fifty hours.

After arriving at New York the *Do-X* would make one trip to the Great Lakes, stopping probably at Buffalo, Cleveland, Detroit, and Chicago, then return to New York City and skirt the North and Central American coasts via the Panama Canal to Pacific Coast cities.

In discussing the flight with associates, Dr. Dornier has insisted that he was not interested in the spectacular aspects of the flight, that it was to demonstrate the feasibility of transatlantic airplane service.

The big seaplane, in reality a flying boat, is of monoplane construction, 162 feet from wing tip to wing tip and with a 152-foot hull. On its transatlantic flight it will be powered by twelve 600-horsepower Curtiss Conqueror motors, manufactured at the Buffalo plant of the Curtiss-Wright Corporation. Two of these motors already have been shipped to Friedrichshafen for installation.

They will develop 1,200 more horsepower than the motors with which she made her test flight last October, carrying 169 passengers.

It is estimated the motors will drive the *Do-X* at a cruising speed of 125 miles an hour.

With the fifty passengers and fuel for the Azores-Bermuda hop she will be carrying a useful load of 40,800 pounds. The fuel alone for one hour of flight weighs 1,800 pounds.

The *Do-X* was launched on Lake Constance July 14, 1929. She was built at Altenrhein, Switzerland, just across Lake Constance from Friedrichshafen, home of the *Graf Zeppelin*.

There have been rumors that Dr. Dornier was connected with the Zeppelin Company, but so far as information in this country goes that is incorrect, and this summer's flight will not be in line with the proposed transatlantic Zeppelin service, which is being financed jointly by German and American bankers.

The 5AT Tri-Motored Seaplane

N. W. Ayer and Son, March 5.—The largest twin-float seaplane in the United States, if not in the world, has achieved an exceptional performance in a series of tests through which it was put at the Philadelphia navy yard and at Hampton Roads, Virginia.

Designated as the 5AT tri-motored seaplane, it is adapted for alighting upon and taking off from water by substitution of two metal floats 22 feet long for the wheels commonly used on the landplane.

Primarily, the ship is a passenger transport plane, which can carry thirteen passengers, baggage, and mail. It can, however, be converted quickly into a bomber or torpedo ship, a 20-passenger troop transport, or a hospital air ambulance.

As a torpedo carrier, it has a capacity for two Mark IV torpedoes, weighing 1,800 pounds each. As a bomber, with landing wheels substituted for floats, it has a useful load of 6,000 pounds, equivalent to a cargo including a pilot, radio operator, bomber, gunner, three machine guns, two 1,100-pound bombs, 800 pounds of smaller demolition bombs, and fuel sufficient for five or six hours' flight.

The craft differs from flying boats, which have been built to larger dimensions, in that it can be converted readily from water to land use. If desired, skis can be attached to replace the pontoons, so that it is adaptable to polar conditions. This was the case with the somewhat similar Ford craft used by Rear Admiral Richard E. Byrd for his South Polar expedition, which was tested with skis and for low temperature work in Canada before its historic performance at the bottom of the world.

While not amphibian, the great seaplane has much of the flexibility of that type. Little time was required and no difficulty experienced in making the shift to pontoons at the Navy's aviation plant at Philadelphia after the flight from Detroit, equipped with landing wheels.

Preliminary tests at Detroit were halted by the formation of ice in the river and consequent risk of damaging the pontoons. At Philadelphia, floating ice in the Delaware River interfered somewhat with the tests, but on several occasions the ship was taxied through fields of drift ice without causing any harm.

The trial trips at Philadelphia showed that, with full load, the plane had a high speed of 127 miles an hour, a cruising speed of 103 miles, a stalling speed of 65 miles and that with full load it can take off in 17 seconds. This is considered an outstanding performance for military or commercial twin-float seaplanes.

As a wheel equipped ship, the 5AT has a high speed of 135 miles an hour and a cruising speed of 113 miles.

The ship is powered by three Pratt and Whitney Wasp motors, with a combined horsepower of 1,275. The tests at Philadelphia demonstrated that the craft, as a seaplane carrying thirteen men, could climb at the rate of 850 feet a minute at a 3,000 foot altitude with all three motors in action. With any two in use and the third cut out the ship climbed about 300 feet a minute.

Normal cruising speed was maintained on any two motors with the third idling. When the two wing motors were cut out and that on the nose alone was in use, the craft lost altitude to such a slight degree that the result would be described as a "very long gliding angle."

With all motors off, the plane can glide 8.7 miles for every mile of height it reaches.

In passenger transport service, the ability of a ship to keep its speed on two motors,

or to climb if desirable, is of obvious importance. It is no less important as a military factor, since in the event of engine trouble, the plane could maintain its place in formation, or, if carrying a load, could accomplish its mission or return to its base without having to discharge its torpedoes.

In an altitude test the craft, fully loaded, reached 15,500 feet. The gross weight on this trip was 13,500 pounds or slightly more than six tons. The weight of the ship itself is 8,825 pounds.

The wing span, over all, is 77 feet 10 inches; the length is 49 feet 10 inches, wing area is 835 square feet, the height 14 feet 6 inches, and the normal gasoline capacity 277 gallons. This can be increased to a maximum of 355 gallons.

The maximum radius of action is 625 miles. Electric inertia starters permit all motors to be primed and started from the cockpit without either pilot or mechanic leaving it.

Other specifications include: average width of cabin 4 feet 6 inches; height of cabin 6 feet; length of cabin, 18 feet 9 inches; 13 removable passenger seats; baggage space, 30 cubic feet; metal propellers; 25 ampere generator; oil capacity, 34 gallons.

The wing loading is 16.2 pounds per square foot, while power loading statistics are: one engine, 31.8 pounds per horsepower; two engines, 15.9 pounds per horsepower; three engines, 10.6 pounds per horsepower.

Helium Production at Amarillo

New York *Herald Tribune*, March 16.—At a cost of a fraction more than $12 a thousand cubic feet, approximately 1,000,000 cubic feet of helium gas was produced at the United States government plant here during January. The gas was of 98 per cent purity. Construction of additions to the plant and the storage tanks, which will double their capacity, is now under way. F. A. Vestal, engineer in charge, states that by July 1 production by the plant here will be ample to supply the dirigible needs of the United States Army and Navy, even should the quantity which these two departments of the government are now using be doubled.

During 1930 the needs of the government dirigibles will be approximately 12,000,000 cubic feet of helium, it is estimated, and it is expected that twice this quantity will be required in 1931. In the additions now being made equipment from the old helium plant at Fort Worth, which has been dismantled, is being used.

The present storage capacity here is 1,000,000 cubic feet. This is being increased to 2,000,000 cubic feet. It is planned to have sufficient helium in storage by the time two new dirigibles of the Navy are completed in 1931 to supply them with the non-inflammable gas.

Improved methods have brought about an enormous decrease in the cost of producing helium during the last eighteen months, and it is believed by Mr. Vestal that a still further reduction will be made soon.

The supply of gas from which helium is extracted comes from extensive government holdings in the Amarillo territory, including four wells with a combined open flow of 32,000,000 cubic feet daily and gas leasehold rights on 26,000 acres, estimated to contain fifty years' supply of helium. The wells are connected with the helium plant by eleven miles of 6-inch high-pressure pipe line. Negotiations are pending for the purchase of surface and gas rights to 11,833 acres.

The helium produced at Amarillo is 3½ per cent purer than that produced at the Fort Worth plant, Mr. Vestal said. This higher purity helium has a greater lifting power of lighter-than-air craft than that formerly used.

Army Aircraft Concentration in California

New York *Herald Tribune*, March 2.—The nation's aërial fighters stationed at this base and at the other stations throughout the country have begun preparations for the national concentration of military aircraft forces at the Air Corps field exercises to be held in California next month. During the aërial maneuvers, which will be held from April 1 to April 24, several new tactical theories in air operation are to be tested.

The coming exercises will mark the first time that there has been a national concentration of military planes on the Pacific Coast. More than 130 ships will participate in the maneuvers, which are to be conducted under the command of Brigadier General William G. Gilmore, assistant to the chief of the Air Corps in charge of training and operations.

While the major portion of the flight problem will be worked out at Mather Field, near Sacramento, some of the principal operations will be conducted near San Francisco, and this will be the first time that plans have been used on a large scale in a stimulated coast defense operations. It is believed that in this phase of the aërial exercises the question of the battleship versus the airplane will be reopened.

The first week of the military aircraft exercises will be devoted to the training of the elements within the various groups to be represented in the concentration and which will be drawn from all parts of the United States. This will involve training in airdrome discipline, including traffic problems, such as prompt take-offs and landings with a view to perfecting coördination of combined units on congested areas.

With a total of 130 planes on one field, F. Trubee Davison, Assistant Secretary of War for Aëronautics, has pointed out in detailing the plans for the coming maneuvers all elements of necessity must be very accurate, not only for the success of tactical operations but for general safety as well.

The second week will be devoted to elementary tactical problems involving each type of aircraft and including practical tests of new and untried tactics which have been evolved from previous exercises.

British Air Budget

New York *Times*, March 9.—The additional expenditure of $4,450,000 on aviation was announced today by Lord Thomson, the Secretary of State for Air, in his department's estimates for the coming year. The total amount the government will spend on aviation is $89,250,000, as compared with $84,000,000 last year.

Most of the increase comes from expansion in civil aviation and its equipment. The additional expenditure on the Royal Air Force, however, is comparatively modest and is "designed to demonstrate," according to Lord Thomson, "the earnest desire of the government to avoid disastrous competition in air armaments."

The government agrees to continue its subsidizing of light airplane clubs, of which there are now thirteen in Great Britain. The university air squadrons at Oxford and Cambridge also will be continued, and Lord Thomson declares they are showing excellent results. Some criticism is expected by the government on the limiting of the home defense program to fifty-two squadrons, but the limitation reflects the MacDonald Cabinet's desire for the ruthless cutting of all military expenditures.

Regarding airships, Lord Thomson expresses satisfaction with the *R-100* and *R-101* and affirms his faith in their future accomplishments. "Both airships have proved to be thoroughly stable and easy to control," he declares.

The department's estimates make provision for a flight of the *R-100* to Montreal in the spring or summer, for a flight to India by the *R-101* in the autumn and for a flight by a squadron of flying boats over the Baltic Sea in the summer.

MISCELLANEOUS

The Security of Armaments

Naval and Military Record, March 12. By Sir Herbert Russell.—Armaments are the material expression of a nation's strength. They are the sinews of the national body upon which it depends for the ability to take its own part in the world. When we find any national body strenuously developing its sinews we reasonably suspect that it is getting into training for a fight. The causes leading to this process of muscular expansion may be obvious, or they may be speculative. We are just now in a period when there is no visible effort at developing the biceps on the part of any of the great national bodies. And so the pacifists have proclaimed that the era has dawned when there is no longer any need to maintain sinews, that soft brains will supplant sturdy brawn, and that we may throw away our gloves and go out of all training with any idea of remaining ready to back right with might.

Moral righteousness is a fine thing. But it is a precious poor substitute for physical fitness. The man of atrophied muscle who is reduced to the pitiful gesture of turning the other cheek to an impudent aggressor is not going to find much consolation for his humiliation in the sense that moral right is on his side. He merely feels burning shame at his impotence to point moral right with one on the solar plexus. He knows that his impudent aggressor is simply trading on his muscular impotence. A great country is a strong country, the terms are synonymous. But strength must take a tangible form. Who, down to the early nineties,

thought of Japan as a great country in what I will call the diplomatic interpretation of the term? An interesting country—a fascinating country—a charming people, and all this sort of thing, but great? What had they ever done in the world? Then they mopped-up Chinese sea power like a dogfish let loose amid a school of herrings. Next they mopped-up Russian naval and military power with a thoroughness which set the Western world rubbing its eyes in astonishment. Their greatness had always been there only we had not realized it until they showed their strength. Again and again during the wave of demoralization caused by the retreat from Mons I heard men exclaim, "We must get the Japs over to beat the Germans!" The suggestion was illuminating as illustrating the respect in the popular mind for the Japanese nation as a result of the splendid demonstration they had given of their capacity for taking their own part. Russia thought they would discreetly retire before her unwieldy bulk; instead, they girt their sinews and just doubled up that unwieldy bulk.

And so it has been throughout the world's history. The concrete symbol of the greatness of this little country is the badge of the crown and the foul anchor. It is the label of our national sinews, never wholly absent from the contemplation of foreign chancelleries when we are arguing a point with them. When Mr. Philip Snowden took his stand against the foreign statesmen at The Hague who were seeking to filch our just right still further, all those statesmen instinctively felt that they were up against the spokesman of a strong country. Had the self-same man taken up the self-same line on behalf of a weak country what sort of a chance are we to suppose he would have stood? There was naturally no sort of hint that the rapacious foreigners were endeavoring to best the strongest sea power in the world, but I have not the least doubt that a sub conscious realization of the fact proved Mr. Snowden's greatest asset. He was in a position to be as brusque and downright as he pleased, and he was in that position because at the back of moral right (which does not trouble international financiers) was the impalpable reality of superior physical might. It appears to me that the one country which nowadays realizes this truth is the United States. She wants a preponderant Navy for the sake of prestige, to add weight to whatever she may say in the course of her mentorship of the rest of the world. She wants it to "show the flag," and, after all, showing the flag is only a friendly way of reminding other people of national strength.

Ever since the world became civilized armaments have been a very definite adjunct to diplomacy. The fluctuations in them are dictated by changes in political situations. "Sabre-rattling" has never been in our line, but the existence of a supreme navy has proved a palpable influence in determining various critical situations which come easily to mind in a retrospect of the past half-century. The current view of certain British and American statesmen is that such coercive influence is no longer necessary in this (presumably) vastly improved world, but I must confess that I cannot find any practical evidence of a similar faith in other countries. The statesmen who count in America are determined that their pacifist pacts shall be backed by the "biggest ever" in the naval line; other people may believe in pacts if they will, but the land which mainly promotes and fosters them believes more in armaments. Curiously enough, no other nation nowadays seems at all concerned that Great Britain shall reduce her Navy. Anxiety upon the subject is limited to the United States, with whom war is supposed to be "unthinkable." Is it altogether unreasonable to conclude that other nations, having had plenty of experience of the extreme moderation and justice which has always marked British policy so far as this in any way involves the Navy, would prefer to see the British Navy remain supreme than surrender the trident to another navy, whose purpose in claiming a parity studiously calculated in terms of actual dominance is so very obscure? I cannot recall any talk in this country about a "Big Stick Navy." For generations past now we have simply built what warships we needed, and, as regularly as clockwork, successive First Lords of the Admiralty have clearly explained why we needed those warships in presenting the navy estimates to Parliament.

A strong nation, like a strong man, is best fitted to keep the peace. The British people are very desirous to keep the peace, although a good many of them think that the whining of Socialist politicians about the horrors of war are a little bit supererogatory at a time when no such horrors are threatened in any

shape or form. Whether the best way of ensuring for all time against the horrors of war is by signing virtuous treaties, scrapping our weapons, and spending the money saved upon free motor cars for tired people, or some equally worthy object of social reform, is a misgiving only to be answered in one way. We are not liked in the world; in fact, we are thoroughly disliked. Let there be no misconception as to this. But our strength commands respect. We do not want to flaunt that strength any more than an amiable giant with an offensive neighbor feels any necessity to give weight-lifting demonstrations upon his doorstep. But to wantonly sacrifice that which has made us strong and which keeps us strong is to court the fate which has come to all nations when they would no longer be troubled with the obligations imposed by keeping fit to take their own part. I am prepared to be told that this is a quite unnecessary homily as we are not going to sacrifice our strength. To which I can only reply that the amount of canceling of prearranged warship construction which has gone on since the Five Years' Replacement Program was authorized in 1925, "to replace worn-out ships," seems to me a pretty practical example of encouraging muscular atrophy. Has all this "gesturing" to a cynical world enhanced our prestige or gained us one atom of respect? It certainly has brought us ridicule and contempt, not, indeed, for what we have done, but for the way of doing it.

In the past our sea power has waxed and waned in response to the changing conditions in world affairs. But we have always remained "captain of our soul" in the matter of determining the waxing and waning. We have been influenced certainly by what other nations have done, but we have never asked them what we may do or told them what they must not do. In fact, we have regarded the process of "keeping fit" as our own particular business. The French, it may be observed, still take this view. They intend to keep up that element of their national strength which is expressed in sea armaments. They have joined in discussion upon the subject so as to maintain the comity of nations, but on the very clear understanding that they were not going to stand any humbug. They are not preparing for war; if any people on the face of the earth have had enough of war for a very long time to come it is the French. But they believe that the possession of a hundred submarines will give them a much more weighty voice in world counsels and, therefore, when they are asked to agree to the total abolition of the submarine they politely request that more such bunkum shall be talked. What is the consequence? We are bound to admit once again that the French are the most logical nation on earth and they gain enhanced prestige for declining to reduce their strength.

Russia is said to be arming her Red Army to the teeth and preparing for "an inevitable world war." We read this with indifference. Why? Because our own strength enables us to treat it with indifference. We feel that a fleet in the Baltic, with aircraft carriers sending droves of airplanes over St. Petersburg, or Petrograd, or Leningrad, or whatever the blessed place is now called, is a possibility to leave the Soviet satisfied with violent talk and nothing more. China continues to threaten all sorts of funny things against the cursed foreigners who will not give up the concessions which they have converted from mud and bamboo jumbles into splendid townships. But nobody takes all this very seriously because the China squadron is a permanent silent reminder to the Celestial exploiters that "no can do" is the final comment upon all their heroic talk. Thus we see how our armaments preserve the peace by the very simple process of making the would-be conquerors afraid to break it. We can tell Russia and China—and anybody else for the matter of that—that we are not going to stand any nonsense and they know that we have the strength to make good our admonition. In the early days of the Great War children were taught to "thank God and the British Navy for their daily bread." There was no irreverence in this literal truth. It has become a perverted habit of thought with our pacifists to think and talk about our armaments as a perpetual provocation to war. They are arguing that we must "ensure the peace" and that, to do this, we must cut down the means of making war. In other words we must voluntarily renounce keeping ourselves fit to take our own part and trust in the kindly good will of other nations not to give us a slap in the face. This may be good stuff for Sunday schools. But when it forms the doctrine of British statesmen it certainly arouses a sense of dismay.

NOTES ON INTERNATIONAL AFFAIRS

From March 3 to April 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

LONDON NAVAL CONFERENCE

Progress Toward Security Pact.—Despite the heroic efforts of the British and American delegates at the London conference to avoid dangerous political commitments, it became increasingly clear during March that the conference could be saved only by meeting in some manner the French demand for a definite statement of what England and the United States would do on threat of war. At last, during the first week of April a solution appeared in sight when it was announced that British and French representatives had agreed in an interpretation of Article XVI of the League Covenant, relating to concerted action against an aggressor nation, which would in some measure meet French demands. Assurances in this point from Britain would clear the way for a purely "consultative pact" in which the United States would be included, and thus lead to French naval reductions, and the possibility of a five-power limitation agreement on the basis of figures already virtually accepted by the United States, Great Britain, and Japan.

The first weakening in the British and American reluctance to make political concessions came on March 9 when Premier MacDonald in a radio speech broadcast in the United States spoke definitely in favor of a "mild" political agreement. Then on March 26, Secretary Stimson gave out a statement the purport of which seemed to be that the United States "had no objection to entering into a consultative pact as such," if it were perfectly clear that this involved no obligation of military assistance, and if French demands for increased security could be taken care of otherwise (i.e. by assurances from Britain). Reports from London expressed the belief that the American delegation had gone further than President Hoover would approve; and from Senator Borah, Senator Swanson of Virginia, and others came protests against a consultative pact which would apparently mean something to France and nothing to us. On March 29, however, the State Department declared that the President and the London delegation were in complete accord—an announcement which was interpreted in the press as meaning that the President preferred the risk of defeat of a political treaty in the Senate to a conference barren of results.

Japan Accepts Naval Figures.—In the middle of March announcement was made that definite agreement on naval tonnage figures had been reached in informal negotiations between Japanese and American delegates. The terms of the agreement when reported to Tokio aroused strong protests from Japanese naval authorities, but they were finally approved by the Japanese Cabinet in instructions to the London delegates

Classes	TONS		Japan's percentage
	U.S.	Japan	
8-inch gun cruisers	180,000	108,400	60.2
Smaller cruisers	145,000	101,500	70.
Destroyers	150,000	105,000	70.
Submarines	52,000	52,000	100.
Total tonnages	527,000	366,900	69.6

made public April 1. With certain reservations made by the Japanese, the tonnage figures tentatively agreed upon were as shown on the preceding page.

CODIFICATION OF INTERNATIONAL LAW.—Delegates of forty-four nations began sessions at The Hague on March 13 in an attempt under League of Nations auspices to harmonize and codify international law. The work of the conference was divided among three commissions: one on nationalities, one on territorial waters, and a third on the responsibilities of states toward foreigners. As codes are agreed upon they will be drawn up in the form of conventions to be submitted to the nations for acceptance.

EUROPEAN POLITICS

RATIFICATION OF YOUNG PLAN.—The final step in putting into effect the Young Plan in Germany was made on March 13, when President von Hindenburg signed the law within twenty-four hours of its passage by the Reichstag by a vote of 265 to 192. The separate American debt agreement was also ratified. President von Hindenburg issued an unexpected proclamation declaring the new arrangement a step toward Germany's freedom and reconstruction, and calling for an end of political quarrels and united effort for economic improvement.

The French Chamber took similar action on March 29, the ratification marking a final triumph for M. Briand's policy of conciliation begun at Cannes ten years ago, and insuring the removal of French troops from the occupied areas by the end of June, as well as the opening of the International Bank in May.

NEW GERMAN CABINET.—The new German Cabinet organized by the Centrist leader Heinrich Bruening took office on March 30. Succeeding the ministry of Hermann Mueller. The new cabinet retained Julius Curtius as Minister of Foreign Affairs, thus insuring continuation of the Stresemann policies, and made only three changes in other posts, these latter representing a definite shift to the right. The fate of the new government, commanding only 199 votes against 218 for the opposition, was dependent on whether it could draw sufficient votes from the Nationalists to secure a majority.

IRISH CRISIS.—After eight years in office, the Irish Free State Cabinet headed by President William T. Cosgrave resigned at the close of March after sustaining a defeat in Parliament on its policy of opposition to old-age pensions. Under the constitution of the Free State, the selection of the cabinet head, or President of the Executive Council, is decided by a vote of the Parliament or Dail Eireann. When this vote was taken on April 2, with all government supporters present, Mr. Cosgrave was easily reëlected over the chief opposition candidate Eamon de Valera.

Ireland's chief problems today are the political problem created by the strong republican opposition led by De Valera, the constant decrease of population due to emigration, and the unfavorable trade balance, which shows an increased export trade but still greater increase of imports.

FRANCO-ITALIAN CLASH.—Perhaps as a hint that a security pact for the Mediterranean might be packed with trouble, press reports of March 15 announced the penetration of Italian military forces deep into African territory in dispute between France and Italy, the occupation of which by Italy would cut the communications between French Equatorial Africa and French Southwest Africa. According to these reports, the more ardent Italian expansionists are demanding an Italian corridor extending from Tripoli southward clear to the Gulf of Guinea.

DEATH OF STATESMEN.—March marked the passing of two figures long prominent in European politics. On March 16 former Dictator Primo de Rivera died suddenly in Paris, little over a fortnight after the fall of his government in Spain.

In England, the Earl of Balfour died peacefully at the age of eighty-two years. A most distinguished figure in British politics and intellectual life, he was the last of Queen Victoria's ministers, a former premier, prominent among British delegates at the Versailles peace conference, and head of the British representatives at the Washington conference of 1922.

NEW POLISH MINISTRY.—After two weeks of strife between Marshal Pilsudski and his Parliament, a new Polish cabinet

was formed on March 29 by General Pilsudski's closest friend Colonel Walery Slawec. Only two changes were made from the Bartel ministry, but these two changes insured more of a "strong-arm government" than before, which will continue the feud between the Sejm and the group of Colonels supported by the Marshal. The new cabinet plans to carry on without Parliament until the next budget session in September.

SOVIETS MODIFY ANTI-KULAC CAMPAIGN.—A pronouncement in March from the Soviet dictator, Josef Stalin, accompanied by a Communist party manifesto, inaugurated a sharp modification of the Russian collectivist campaign against the kulacs, or more well-to-do peasants. The new order was said to have relieved millions of people from deprivation of property and civic rights. While not a vital shift of policy, the change indicated that the drive had encountered dangerous opposition, necessitating a halt and "consolidation of gains."

UNITED STATES AND LATIN AMERICA

NEW POLICY IN HAITI.—At the close of March President Hoover announced the nine "sequent steps" which will govern future United States policy in Haitian affairs, based on the report of the recent Haitian commission. The new plan calls for:

(1) More rapid "Haitianization" of the American treaty services, with the object of training Haitians to take over full responsibility at the expiration of the existing treaty.

(2) In retaining or selecting American officials, preference for those "free from strong racial antipathies."

(3) American recognition of the temporary president of Haiti and the new president to be elected next autumn.

(4) Abolishment of the office of high commissioner, and appointment of non-military minister to take over the commissioner's duties and serve also as diplomatic representative.

(5) Gradual withdrawal of marines in accordance with future arrangement.

(6) Limitation of American intervention in Haitian affairs to those strictly provided for by treaty or other agreement.

This statement was practically a summary of the commission's recommendations, which evidently contemplated ending American intervention so far as possible at the expiration of the treaty in 1936. In general, the commission gave high praise for the work of Commissioner Russell, and declared that the mistakes of the American administration were due to "failure to understand the social problems of Haiti and its brusque attempt to plant democracy there by drill and harrow."

TEMPORARY HAITIAN PRESIDENT.—To settle the problem raised by opposition to the reëlection of President Borno, the American Commission in Haiti secured approval of both Haitian factions for a plan by which M. Eugene Roy, a man outside politics, was selected on March 20 to serve as temporary president until after legislative elections to be held "at the earliest possible date"—presumably next autumn. M. Roy is a wealthy Haitian banker, sixty-eight years of age, and generally respected.

The Commission left Port au Prince on March 15 after two weeks spent on the island.

FAR EAST

NORTHERN OPPOSITION TO NANKING.—Both Shanghai and Peking dispatches during March emphasized the growing opposition to Nanking rule among Northern leaders, though these dispatches differed as to the danger threatened by this opposition. From Peking came reports that all Nanking government bureaus in the city had been taken over by local authorities under orders from governor Yen Hsi-shan of Shansi, and that rival armies were being concentrated along the railways connecting the territories under Northern and Southern control. By April 1 a part of Feng Yu-hsiang's army had occupied Kaifeng, capital of Honan province, and forces of Yen had entered northern Shantung. Yen himself on April 2 assumed the title of commander in chief of the "National" land, sea, and air forces, and declared his efforts would be directed toward saving the Kuomintang and the nation by the overthrow of President Chang. Both sides were bidding for support from the young Manchurian dictator, Chang Hsueh-liang.

PHILIPPINE INDEPENDENCE AND PEACE IN THE PACIFIC.—Under this title Nicholas

Roosevelt in April *Foreign Affairs* presents a very strong argument against Philippine independence, on the general grounds that "the political equilibrium established during the last thirty years would be overthrown, forces of revolution would be unleashed, and America's influence in the East would be sharply curtailed."

First, as regards internal conditions in the Philippines, he maintains that the increased cost of government under independent rule would be overwhelming, business would suffer, and the racial groups in the islands would come into conflict. Second, as regards American interests in the Pacific, independence would seriously affect American prestige, and commerce, the Philippines themselves constituting a valuable source of raw materials and potential market, besides affording us a voice and influence in Oriental problems. Third, independence would be sure to stimulate anti-European movements in the Dutch East Indies and in India. The article concludes:

> In fact, there is every reason to expect that Philippine independence would at once be used by the British as an argument in favor of enlarging their Navy. It is hard to see how even the most anti-English American could controvert such a claim. If the United States were to withdraw from the Philippines the maintenance of the political *status quo* in the insular world between Formosa and Australia would devolve entirely upon Great Britain. The need for the Singapore base would be greater than ever, for Great Britain would no longer be able to count on the presence in Manila of an important contingent of the American fleet, which, by its mere presence, is a force for peace.
>
> That this prospect particularly affects Australia and New Zealand is clear from a reading of the debates in the House of Commons on the Singapore naval base. The people of the two Pacific commonwealths look on Singapore as their main defense in the Pacific. So also they regard the presence of the American fleet in the Far East as a sort of indirect shield between their own empty lands and the over-populated countries of Eastern Asia. The withdrawal of the United States from the Philippines would increase the Dominions' dependence on Great Britain.
>
> To those Americans who have studied the political situation in the Far East one of the most disquieting aspects of the entire problem is the position in which the United States would find herself if independence were granted. It requires but little knowledge of the force of American idealism to realize that if anything went wrong in the Philippines, and they were endangered, the very same American sentimentalists who have for years been crying "Give them their liberty!" would be the first to demand that the Unted States step in to help her former wards and to protect them from the "rapaciousness" of alien oppressors. This is the sort of appeal which moves Americans strongly. It flatters their vanity and appeals to their sense of evangelism. They like to think of their country as the rescuer of the downtrodden, the savior of the oppressed.
>
> If the American government, once it had left the Philippines, were prevailed upon to go to their rescue, it would face the likelihood of a war of appalling consequences. Such a war would involve a vast naval construction program, long and hazardous expeditions to conduct military operations on the other side of the world, the probable mixing in of other powers, the stirring of new resentments among subject peoples of Asia. To the realist, what is most distressing about such a possibility is the virtual certainty that so long as we continue in our present relation these dangers are so remote as to be negligible. To remain is a fair insurance of peace. To withdraw is to invite disaster.
>
> As an alternative it has been suggested that the United States might guarantee the independence of the Philippines, either alone or in company with other powers, or that the League of Nations might give America a mandate over them. These expedients would put the United States in the very position which she has so long sought to avoid—that of responsibility without authority. It would be only natural for the other powers to turn to the United States, in the event things went badly in the Philippines, and call on her to step in and right them. Here again the United States would have to interfere under the most unfavorable conditions. Her task would be far harder than is the present one of attempting to help the Filipinos maintain a stable government.
>
> The crux of the matter, then, is that the Philippine Islands are like Mark Twain's white elephant. They are a burden to maintain, but there is no safe and effective way of getting rid of them. Retention—at least for a number of decades—seems the lesser of two evils.

MISCELLANEOUS

ARTICLES IN APRIL *Foreign Affairs.*—Among the articles in the April issue of the quarterly *Foreign Affairs,* the following are briefly summarized as of special naval or international interest:

Viscount Grey on Freedom of the Seas.—After properly limiting the meaning of the term "freedom of the seas" by defining it as a question of the extent and limits of belligerent rights as regards neutral ships and commerce on the high seas, Viscount Grey argues that it would be wise policy for Great Britain to seek agreement with the United States in these points.

(1) Because the inventions of naval science have made it more difficult even for a superior navy to keep communications open in war time.

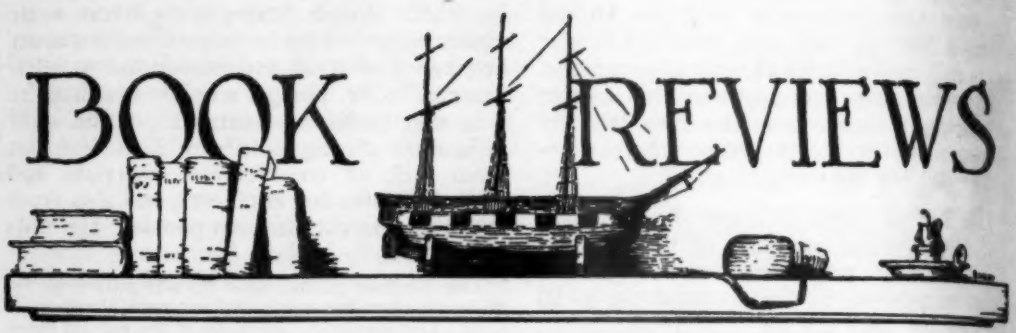
(2) Because in any future war in which England is a belligerent and the United States a neutral, there will recur the danger of conflict over control of neutral commerce.

(3) Because agreement in this matter will bring the two countries into friendly coöperation for world peace, whereas refusal will have the opposite effect.

Is a Second Canal Necessary?—Mr. John F. Stevens, chief engineer of the Panama Canal, 1905-07, points out that the Panama Canal at present is not operated up to 50 per cent of its capacity; that traffic is not likely to increase over 10,000,000 tons per decade; and that a third set of locks increasing the capacity by 75 per cent can be built when they are needed thirty or thirty-five years hence at a cost of from $75,000,000 to $100,000,000, or about one-sixth the cost of a new canal at Nicaragua.

Soviet Five-Year Plan.—Bruce G. Hopper takes up the Soviet "formula of industrialization, a gigantic but realizable scheme" by which Russia "expects to invest some eighty billion rubles in the national economy between 1927-1933 and double the national income." Mr. Hopper's opinion is that the plan may perhaps be carried out, the chief difficulties arising not from financing, but from lack of construction materials and skilled artisans and engineers, and also from the strain on the Russian people. He ends as follows:

> The Russian people have no alternative to industrialization but continued economic backwardness. The population increases at the rate of three million a year, and the old economy, resting on unscientific agriculture, could not meet present demands for ordinary necessities or furnish the needed employment. In driving the population to industrialization the Soviet government is consciously sacrificing the welfare of the present generation to that of the next. Its chosen instrument is the Five-Year Plan. Under its provisions the Russian nation is stripped to the waist, paying for economic isolation and unprogressiveness in the past, and trying to work out its future economic salvation.



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H.O. NO. 208 (HYDROGRAPHIC OFFICE PUBLICATION NO. 208). NAVIGATION TABLES FOR MARINERS AND AVIATORS. By Lieutenant Commander J. Y. Dreisonstok, U. S. Navy. Second edition. 1928. Washington. $.75.

REVIEWED BY CAPTAIN RADLER DE AQUINO, *Brazilian Navy.*

". . . the trouble required by the computer to *learn* the use of a table need scarcely be considered; the important matter is the time and labour saved by it after he *has* learned its use.—*Encyclopedia Britannica,* Eleventh Edition, 1911, Vol. XXVI, page 326. Article: "Table, Mathematical."

Just back to Rio de Janeiro after a pleasant tour of duty on the Upper Paraguay River in command of our naval station and flotilla at Ladario, State of Matto Grosso, it was very gratifying to see a copy of *H.O. No. 208,* second edition, 1928.

Its neat appearance, clear type, fine paper, and handy size will make these tables very convenient for sea and air navigation, although the vertical arguments for latitude run only from 0° to 65° in Table I. This fact reduces their availability for other problems, such as star identification and course and distance in great-circle sailing and in radio position-finding.

To those who have dealings with this ever-interesting subject—navigation—(and this year the writer can claim thirty years at it) the principle and formulas of Dreisonstok's method are pretty well known. With the unnecessary addition, as we will see later, of the log cosecants of the perpendicular a to three places and raised to 10^3 power to find Z'' by means of $C + D$, the method contained in *H.O. No. 208* is simply Bertin's method (as described in 1913[1] by him and by Captain Isaias A. Newton[2]) in which the final corrections of the tabular h are replaced by Souillagouët's method,[3] as modified by Ogura,[4] in 1919.

Those who are familiar with my tables will readily solve any problem along the lines of the methods contained in *H.O. No. 208,* as all the necessary data will be found in them,[5] it being unnecessary to compute $C + D$ in order to find Z''.

[1] *La table de Point Sphérique ou Essai d'une Navigation sans Logarithmes,* in the *Revue Maritime et Coloniale* for July, 1913, to January, 1914. See his *Extrait de la Table de Point Sphérique; Pour Calculer a la Mer Vite et sans Erreur:* Rennes, Imprimierie Oberthur, 1918, and also his enlarged edition *Tablette de Point Sphérique; Méthode Générale de Calculs Nautiques, Simple, Rapide, Sure, Precise et Sans Logarithmes:* Paris, 1919, Gauthier Villars et Cie.

[2] *Novo Processo Rapido Para a Determinacao de Rectas de Altura, Applicavel ás Taboas de Radler de Aquino e de Souillagouët.* Lisbôa, 1912. Reprinted from the *Anais do Club Militar Naval de Lisbôa,* No. 3, 1912. See also Nos. 6, 7, and 8 of these annals for 1912 and No. 5 for 1913 for Newton's modifications.

[3] *Tables du Point Auxiliaire Pour Trouver Rapidement la Hauteur et l'Azimut Estimés:* Paris, 1891. Second and last edition, Toulouse, 1900.

[4] *Shinkodo Hoikakuhyo (New Altitude and Azimuth Tables).* Tokyo, 1920. Published by the Japanese Hydrographic Department. A new edition was published in English in 1924.

[5] *The "Newest" Navigation and Aviation Altitude and Azimuth Tables* for facilitating the determination of lines of position and geographical

Commander Dreisonstok has followed Lord Kelvin, Souillagouët, Delafon, Bertin Obrecht, and Smart and Shearme when taking the auxiliary arcs b and B (my c and C) while Garcia Moansilla, Newton, Ogura, Weems, and others take my b and my C which simplify the rules and precepts and render them mnemonical. Use of the tables is better understood if precepts are given:

The precepts for *H.O. No. 208* would be as follows, using Dreisonstok's notations:

d and L same name

$$\begin{cases} b+d<90°: & B=b+d; & Z=Z'+Z'' \\ t<90° \begin{cases} b+d>90°: & B=180°-(b+d); & Z=Z'-Z'' \\ \end{cases} \\ t>90°\ldots\ldots: & B=d-b; & Z=Z''-Z' \end{cases}$$

d and L contrary names

$$B=b-d; \qquad Z=Z'+Z''$$

These precepts, of course, can be reduced to two:

d and L same name.....$t<90°$: $B=b+d$
Other two cases.....: $B=b\frown d$

In the Brazilian Centenary Edition (London, 1924) and in the U. S. Naval Institute's Edition (Annapolis, 1927) of my tables I gave a full description of Bertin's method, and showed how they could be used advantageously. These descriptions, I believe, are the only ones that have appeared in the English language and probably account for Bertin's methods and tables being so little known outside of France.

In comparing these precepts with those contained in my tables for Bertin's method one can readily see that the use of my b and C transfers the case in which a supplement appears, to the case in which t is *greater than* 90° and the century-old rules for combining the auxiliary data (same name, $t <$ 90°, *subtract;* other cases: $t > 90°$ and contrary names, *add*) are readily accepted and understood.

The typical example on the inside of the cover of *H.O. No. 208* worked out according to Dreisonstok's method by means of my 1924 edition, pages 95 and 122, would be as follows:

$a=52°-6'$	$b=56°-58'$	$\alpha=39°.9$
	$d=\ 2\ -21N$	$\beta=64°.8$
	$C=59°-19'$	$Z=104°.7$
	$1/2$ log sec $a=10582$	
	$1/2$ log sec $C=14609$	
	$1/2$ log cosec $h=25191$	
	$h=18°-16'$	

Instead of using logarithms, Bertin finishes up as follows: with $a = 52°$ and $C = 59°$ we find $h = 18°-29'$ and $M = 56°-11'$. The corrections for the odd minutes of a and of C (both *always* negative) are $2'.4$ and $10'.5$ which gives $h = 18°-29' - 12'.9 = 18°-16'.1$.

The 1927 edition could be used with great advantage and great accuracy by simply adding to it nine pages of my ½ log sec table, contained in my 1912, 1917, 1918, and 1924 editions (latitude or declination tables from my *New Log and Versine Altitude Tables,* 1912, 1917, 1918, and 1924).

In going through *H.O. No. 208* I have noticed quite a few differences in the values of A in Table I when comparing them with those in Ogura's Tables. For $L = 31°$ and $t = 67°$ the value given is 21159 while the exact value is 211578. Ogura gives 21158.

These differences show that it is impossible to obtain in *all* cases "a precision within $0'.1$," as stated on Pilot Chart No. 2600 of the South Atlantic Ocean, June-July-August, 1929.

The process is like Souillagouët's *tabular and logarithmic,* although the logarithms appear in disguise as whole numbers.

The arrangement of the arguments should have been given as Souillagouët did give originally in his *Tables du Point Auxiliaire, 1891,* and as adopted in my tables with the latitude or declination at the bottom of the pages and H.A. on the sides, as H.A. changes 360° in every 24^h, while L, in the same interval of time, changes in ships at sea at most 12°. *Pages are only turned for a change of latitude.*

The typical example worked out by my 1927 edition, where all arcs are given to the nearest $0'.1$ (within $3''$) and h is *always* found within ¼′ ($0'.25$) of its *exact* value, would run as follows:

(*Page* 91)

$a=67°$	$d=\ 2°-21'.0$N	$t_Q=116°-37'.7$	
	$d'=\ 2\ -20\ .4$	$t_A=\ 67\ -06\ .8$	
$b=\ 6°$			
$L_A=31$S*	$\Delta_d=\ 0°-\ 0'.6$	$G_A=\ 49°-30'.9$W*	
$C=37°$			
	$h'=18°-11'.0$	$Z'=$N $75°.7$W	$\alpha=\ 84°.5$
	$\Delta_h=\ \ 0\ .3$		$\beta=\ 39\ .3$
	$h_A=18°-10'.7$		$M=123'8$

position at sea and in the air. The simplest and readiest in solution. Third electrotyped edition: London, 1924. Published by J. D. Potter, Admiralty agent for charts, etc., 145 Minories, E.C. 3. Price 20 shillings. The Altitude and Azimuth Tables are also contained in *H.O. No. 200.*

In ordinary navigation at sea and in the air Δ_d = 0′.6 could be considered as 0′ (zero) and *M would not have to be found from α and β.*

The *whole* calculation would reduce itself to:

a = 67° (page 91 from which *all* data are picked out)

b = 6°	t_G = 116°–37′.7
L_A = 31S*	t_A = 67–6.8 (exact value 67°06′46″.8)
C = 37°	G_A = 49–30′.9W*

h_A = 18°–11′ Z = N 75°.7W
(exact value 18°10′58″.5)

The combination of b = 6° and L_A = 31° to find C = 37° could be done mentally and the *only* calculation necessary would be to find the assumed longitude G_A from t_G and t_A

In the air a Δ_d as large as 10′ could be considered as 0′ (zero).

Of course my method first proposed in these PROCEEDINGS for December, 1908, can be used advantageously when the azimuth is smaller than 80° and the altitude difference $h - h_A$ can also be reduced to zero—a decided advantage—as no line of position has to be drawn.

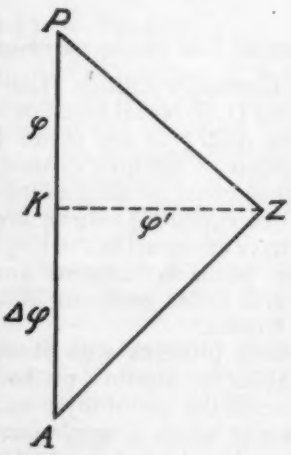
In modern ships with gyro compasses and excellent magnetic compasses the perpendicular *a* or the page from which all data is picked out can be found immediately from *h* and *Z*, and at the same time as a position line is plotted, the gyro compass or the standard magnetic compass is checked and controlled. No D.R. position needs to be calculated.

Observations of azimuth are already used to a certain extent for finding a great circle, a curve or a straight line of azimuth*, as improvements take place in gyro compasses and radio beacons.

This is really the *only* method which "eliminates logarithms and reduces numerical work to a minimum" and it should be of "great value to aviators as well as navigators of submarines and surface craft," and its use should become "mandatory in planes and airships."

As in all tables using sines, cosines, secants, and cosecants and their logarithms, Dreisonstok's method becomes less dependable and less accurate as the celestial body approaches the meridian or the zenith when a whole degree of latitude cannot be used. Table I shows critical points when the latitudes are low and the hour angles approach 90°.

A slight description of Professor Souillagouët's monumental work *Table du Point Auxiliaire pour Trouver Rapidement la Hauteur et l'Azimut Estimés,* July, 1891, new and last edition at Toulouse, 1900, Imprimerie Douladoure-Privat, might not be out of place here. Although Sir William Thomson (Lord Kelvin) had employed twenty years before an *auxiliary* position from which Sumner or position lines were drawn, Souillagouët was the first to start from an *auxiliary* or *assumed* position by taking the latitude and also the hour angle to the nearest tabular values. He was also the first to drop the perpendicular *KZ* from the zenith *Z* upon the circle of declination *AP*. It was only in 1893 that Lieutenant R. Delafon,† following more closely Lord Kelvin's tables, devised his method and introduced the values of angles *PZK* and *AZK* from which the azimuth *PZA* is found.



Souillagouët gave us in his *Table du Point Auxiliaire* three tables. In Table I are given the values of φ and of log cos φ′ for every 15′ of arc from L = 0° to L = 60° and for H.A. for every 1ᵐ from 0ʰ to 3ʰ. From L = 60° to 67° 30′ φ and log cos φ′ arc given for every 30′ of L and for every 2ᵐ of H.A. In Table II the values of φ and log cos φ′ are given for every 30′ of L up to 60° and for H.A. for every 2ᵐ from 3ʰ to 6ʰ. φ is rounded up to the nearest 5″ (five seconds of arc).

* See an article *Curvas e Rectas do Azimuth na Navegacão; Astronomica e Radiogomometrica.* Reprinted from the *Revista Maritima Brasileira,* July, 1928, page 79.

† *Méthode Rapide pour Déterminer les Droites et Courbes de Hauteur et Faire le Point.* Paris: Berger Levrault et Cie. Editeurs.

The basic formulas are as follows:

$$\tan \varphi = \cot L \cos t$$
$$\sin \varphi' = \cos L \sin t$$
$$\sin h = \cos \varphi' \cdot \cos (\Delta - \varphi)$$

naturally, the same as used in *H.O. No. 208.*

In Table III similar to Lord Kelvin's tables φ and φ' are given for every 30′ not only for L or d, but also for t or Z.

Souillagouët employed his Table III for finding the azimuth, and working out all the other problems depending upon a right angled spherical triangle.

Strange to say, in all modern tables based on Souillagouët's method, except in Fuss's[8] and Bertin's, there is no reference to his name or to his monumental work.

[8] *Tablitzi dlya Nakashdeniya Visott i Azimutoff.* Typography of the Imperial Academy of Sciences. Saint Petersburg, 1901.

On board the Brazilian battleship "São Paulo," Rio de Janeiro, November 11, 1929

LA NAVIGATION AÉRIENNE TRANSATLANTIC. By Captain G. Voitoux, French Navy (Retired). Paris: Societe D'Editions Geographiques, etc., Maritimes et Coloniales. 1930.

REVIEWED BY LIEUTENANT COMMANDER D. C. RAMSEY, *U. S. Navy*

The author discusses in considerable detail the effect of wind and weather upon long-distance flights by aircraft and deals fully and comprehensively with the many varying conditions which may be encountered by pilots or navigators of planes embarking on easterly or westerly flights across the North Atlantic Ocean. Captain Voitoux makes use of weather data obtained during steamer crossings over a period of several years and it is interesting to compare his deduced figures of force and direction of the wind for the various seasons and latitudes with those which appear in graphic representation on the pilot charts of the upper air for the North Atlantic Ocean, first published by the Hydrographic Office in December, 1927.

While the author stresses the all-important elements of winds and storms and their effect upon an aërial transatlantic crossing, he does not neglect other factors which may compromise the success of such a flight. He points out, for example, the dangers of ice formation with its attending increase in weight of the plane structure and alteration of airfoil contours. He emphasizes the existing imperfections of those aircraft instruments which become vital accessories when low visibility sets in. In spite of the recognized limitations of planes and equipment he stresses as a most important point his belief that the failure of many of the attempts to cross the Atlantic by air may be laid at the door of personnel deficiencies.

It is believed to be the author's thought, as translated from the original text, that the transoceanic flyer must have, aside from the indispensable qualifications of an airman, a thorough working knowledge of aërial celestial navigation and an equally sound knowledge of the science of meteorology. He points out the fallacy, before a crossing, of attempting through study and analysis of such weather data as may be available to draw up a finished plan for the entire flight. Such radical and unforeseen weather changes may occur over the Atlantic in the course of a 35- or 40-hour passage, that the aërial navigator is forced to discard his original data and fall back upon later information received by radio, or failing this, his own knowledge and resources to meet the emergencies of the moment. Unless he keeps an accurate running record of his true position such information as he may receive from a meteorological broadcasting center of the zones of high and low pressure and other weather data of interest can have but little value. Accuracy in navigation, therefore, is of paramount importance at all times during the flight. Insurance must be carried on such flights in the form of knowledge of the elements and their vicissitudes, skill in the application of the principles of navigation, and resourcefulness under conditions of trial and danger, otherwise in the opinion of the author an adventure of this kind at the present day can have, at best, a doubtful termination.

The author sets forth a series of observations pertaining to Atlantic weather which may be used to advantage by airmen in drawing up plans for an easterly or westerly crossing. Succinctly, these are as follows:

The northeast trades blow with more or less intensity below the twenty-fourth parallel throughout the year.

Winds which have 20 to 25 per cent frequency over the great circles between north-

ern United States ports and the English Channel have but 2 to 3 per cent frequency at the Azores.

Winds increase in intensity with increase in latitude.

Winds over the North Atlantic having components directed towards the east are from two to three times more frequent than those directed towards the west. (This ratio will increase with increase in altitude).

Under normal circumstances northerly and southerly sets will balance out in the course of a crossing. It must follow that in an easterly crossing it is always desirable to keep to the southward of the centers of low-pressure areas and to the northward of the centers of the areas of high pressure. On a westerly flight the reverse is true.

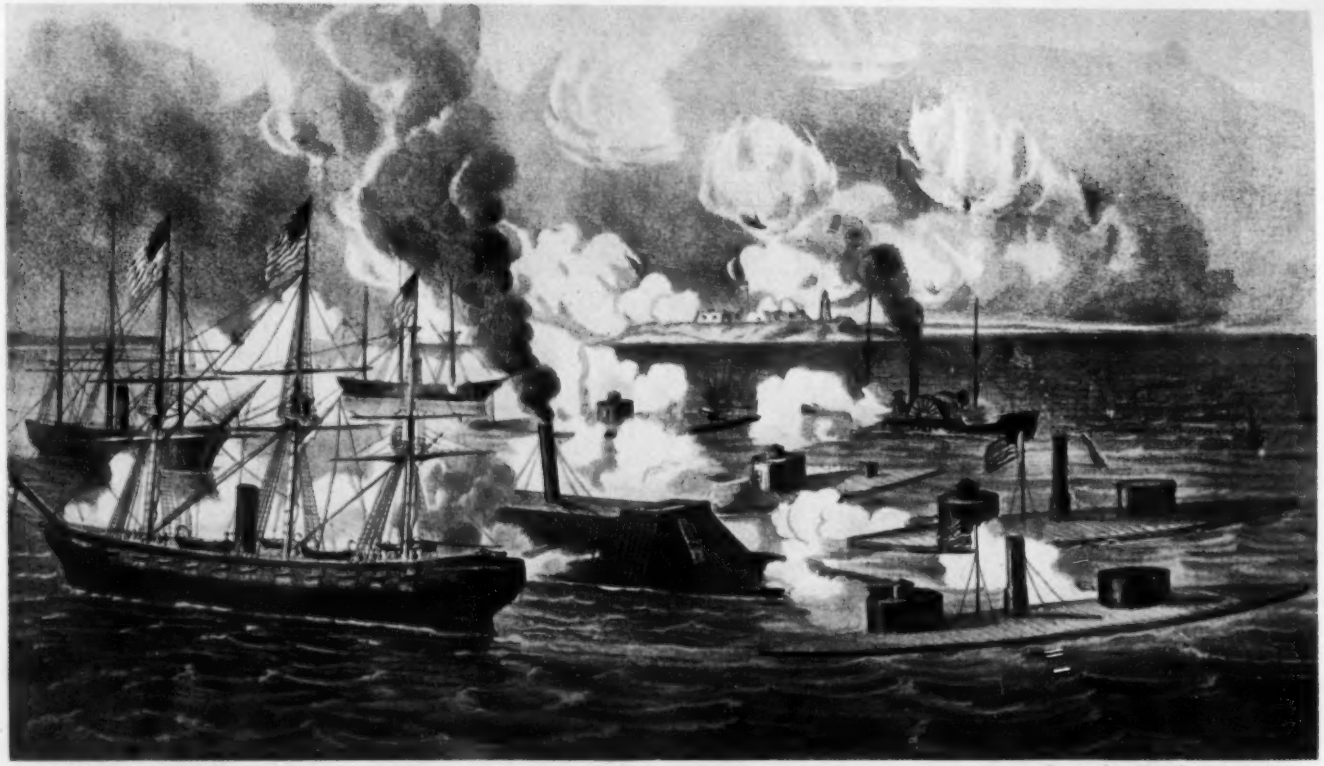
The author holds that the effect of the wind on a plane in flight is more often disadvantageous than favorable. He points out the effect of winds blowing at right angles to the course, which, if compensated for, develop into retarding elements. This may be true, likewise, of winds of appreciable force blowing from certain compass points in excess of 90 degrees from the flight path. It is interesting to tie up these facts with the author's contention that northerly and southerly sets usually balance out during an aërial crossing of the north Atlantic. With fair weather prevailing throughout the flight such a condition naturally would make it undesirable to attempt to hold to the true course at all times.

Captain Voitoux discusses the characteristics and types of aircraft best fitted to undertake a transatlantic voyage and emphasizes the importance of high cruising speeds. He favors, therefore, heavier-than-air craft rather than lighter-than-air craft for such operations and presents the following example to illustrate his point:

A rigid airship with a cruising radius of 7,500 miles at 100 miles an hour undertakes a westerly crossing of the Atlantic (3,750 miles), encounters head winds of 50 miles an hour average velocity and arrives at its destination with zero margin of safety in fuel, whereas a plane with a cruising radius of but 5,600 miles and a cruising speed of 180 miles per hour accomplishes the flight under the same adverse conditions with over two hours fuel left in its tanks. While the assumed performance data are somewhat fantastic, the advantage of high cruising speed is clearly demonstrated.

Captain Voitoux presents additional figures to show that a margin of safety of 1,250 miles in cruising endurance is not excessive for westerly flights in the high latitudes. This is supported by the statement that on an average of 20 days out of 100 winds of from 40 to 70 miles per hour velocity may be expected in the vicinity of the northern sea lanes followed by transatlantic steamers. It is also supported by the record of the flight of the British rigid airship *R-34* from England to the United States via the northern route shortly after the war. It will be recalled that this vessel took departure with what was considered to be ample margin of safety in fuel and finally eased up to the mooring mast at Mitchell Field with dry tanks.

The author's treatment of his subject is illuminating and interesting and his book particularly deserves the careful attention of those who contemplate aërial crossings of the Atlantic in the future.



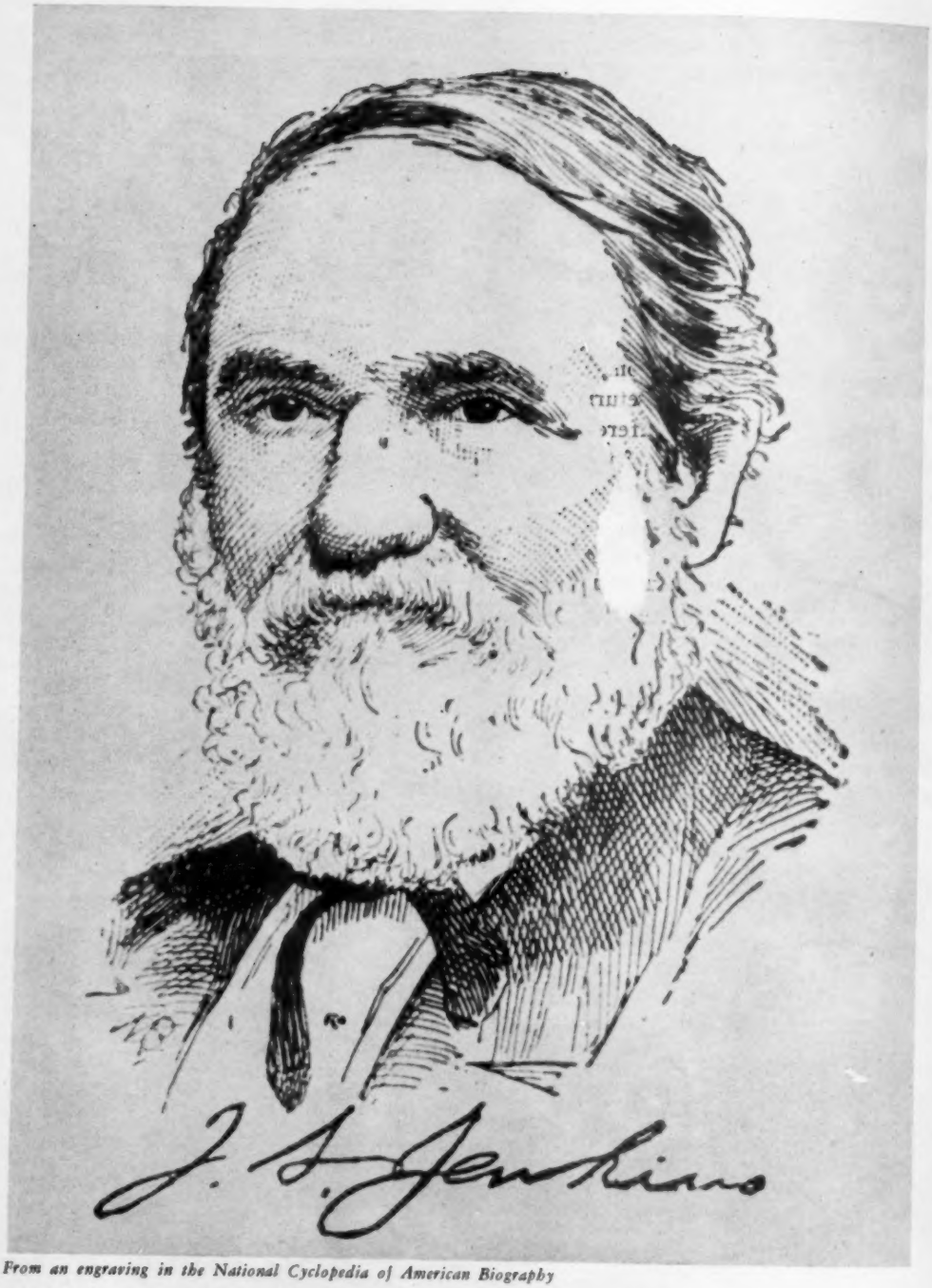
Courtesy Naval War College *From the Macpherson Collection*

THE BATTLE OF MOBILE BAY, AUGUST 5, 1864

(From a color lithograph published by Currier & Ives, contemporary)

While the *Hartford, Monongahela, Ossipee,* and *Lackawanna* were turning with all speed to run into the *Tennessee,* the *Brooklyn* and *Richmond,* with the monitors *Manhattan,* 15-inch guns, the *Chickasaw* and *Winnebago,* 11-inch guns, were battering to pieces the iron casemates of the *Tennessee.* Rear Admiral (then Captain) Thornton A. Jenkins was in command of the *Richmond.*

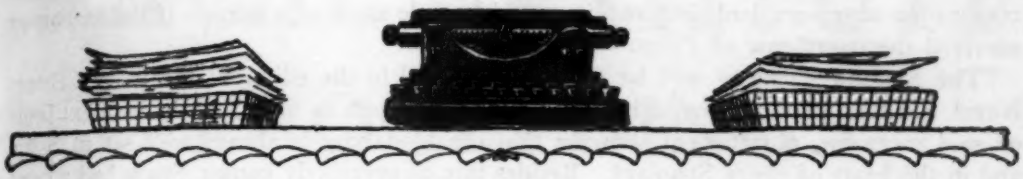
UNIV. OF MICH.



From an engraving in the National Cyclopedia of American Biography

REAR ADMIRAL THORNTON A. JENKINS, U. S. NAVY
The seventh president of the U. S. Naval Institute, 1883-85

SECRETARY'S NOTES



Drawing to a close

The London conference is rapidly drawing to a close. Many of the technical staff have returned home and by the time this issue of the PROCEEDINGS appears, the conference will be history.

Although all of the details of the pact have not been published at the time this is being written, enough is known to give an idea of what has been accomplished. Whether the pact will be accepted by the Senate is something that only time will tell; however, the President has expressed considerable pleasure at the success of the conference and probably so will the Senate in its action.

Three nations, Great Britain, Japan, and the United States have come to an agreement on all categories of vessels, while France and Italy agree to some of the principles of the pact. Possibly the last two countries will eventually come to some sort of an agreement, given more time to consider the questions raised.

The principal accomplishment of the conference is the settling of the ratios of categories other than capital ships and aircraft carriers; the gap left by the Washington conference has been definitely closed. This gap was the cause of most of the recent ill feeling over naval armaments. The race for advantage in auxiliary types of war vessels, a race not instigated by the United States, threatened to destroy all the good feeling built up by the Washington conference.

The further reduction of battleships and postponement of replacements promises some saving in the cost of the maintenance of the Navy.

From the standpoint of the Navy, we are now assured of a properly balanced fleet of modern ships of all classes, second to none; that is, if we live up to the terms of the London conference. Already the pacifist groups are assembling in Washington to heckle our legislators into not voting the funds necessary to live up to the pact. They want the United States to set the style in being disarmed. We believe they will get little comfort, for Congress is getting sick of being imposed upon.

The public, in general, will realize from the London conference, what our delegates to the Geneva conference were up against. That the delegates to Geneva did not sacrifice the interests of the United States in order to bring back something is to their everlasting credit.

All told, the effects of the conference are for the general good of the Navy. For the last six months affairs of the Navy were constantly before the public. There is no reason why anyone in this country cannot intelligently discuss the Navy. What more can we wish? If the public understands the problem of national defense, we need have no fears for the Navy.

The other side of the picture

The Naval Institute does not wish to be unfair in anything that it prints. For that reason, we are quoting here a letter received from the Spanish Naval Attaché.

"The Spanish Embassy in Washington has seen with regret the statement made in the United States Naval Institute PROCEEDINGS for March, on page 255 it is stated 'though responsible observers had declared it would be little short of a miracle if the monarchy survived the overthrow of Primo's control.'

"The Spanish Embassy will be extremely obliged to the editor of the United States Naval Institute PROCEEDINGS if he would be kind enough as to publish in the next issue of said magazine, a statement showing that the Monarchy is always well set in Spain and in the heart of every Spaniard. Besides this, as everybody knows, Spain had a brief trial of Republic in 1871 which did not last even a year and that during that period there were three presidents of the Republic. Washington, D.C., March 19, 1930."

The quotation to which exception is taken is from an article published in the February issue of *Current History,* written by the Madrid correspondent of the Manchester (England) *Guardian,* presumably a responsible observer.

We are glad to print the Spanish Embassy's letter, as it gives another and very valuable viewpoint.

It just will happen

In the April PROCEEDINGS, in the caption under a picture of a model of the *Ville de Paris,* it was stated that "The original . . . . was the flagship of De Grasse at Yorktown, and was captured at the Battle of the Saints, April 9, 1782. On her decks in 1810, Admiral Collingwood, second in command at Trafalgar, died."

One of our members, Mr. Cyril Morand, called our attention to the fact that the original *Ville de Paris* foundered on the night of September 16-17, 1782, on her way back from the West Indies, after the Battle of the Saints.

Admiral Collingwood died on the decks of a namesake of the original *Ville de Paris.*

Battle at Blanc Mont

This monograph will be out in book form in a short time, if not already delivered. We are printing a very limited edition and orders are already on hand for six hundred copies. If members of the Second Division want copies before the edition is exhausted we would advise getting them now. We hope the price will be not more than $2.00; it may run up to $2.50, but no more. There will be about 140 pages of text and 60 full page illustrations.

How about your home town?

Do they know anything about the Navy? Do they consider it a part of themselves? Why not send the PROCEEDINGS to your public library for a year? Members can send a subscription for $3.50 per year.

"On a Destroyer's Bridge"

The Naval Institute will bring out, in the near future, a book by Commander Frost detailing his personal experiences in handling a destroyer under many varied conditions. Commander Frost commanded a destroyer in the Atlantic and on the Asiatic station.

The book gives an excellent description of the problems of a destroyer skipper and is written, not to tell others how to handle their ships, but to tell how one officer handled his ship. It is elaborately illustrated with sketches of the situations.

Price will be announced later.